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STEEL

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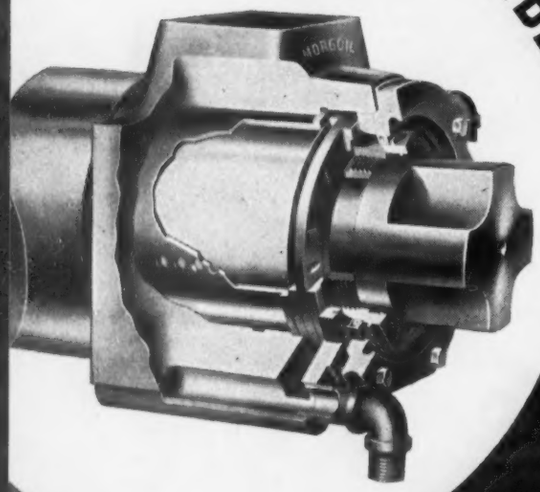

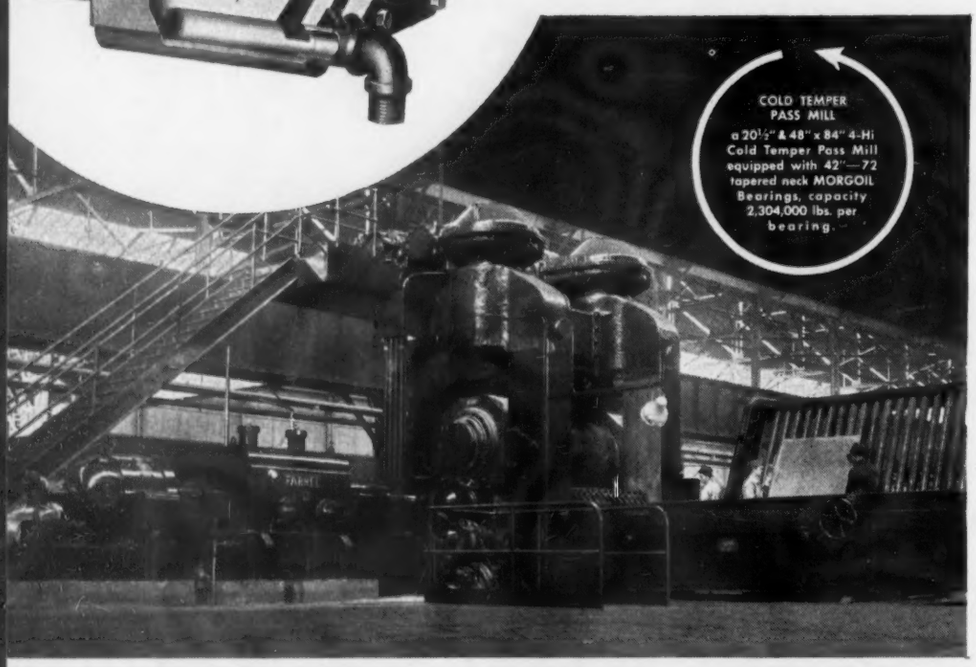
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As the Editor Views the News

■ EXPANDING demand has placed so much tonnage on books that by the end of last week some steel companies found themselves committeed to capacity during the remainder of this year (p. 23) while most others were approaching that condition. Steel production jumped another 5½ points to 79.5 per cent of ingot capacity, with preparations under way to place all available facilities, and some that had been earmarked for dismantling, in operation. Rehabilitation of such plants is expected to involved total expenditure of about $40,000,000; in addition, current inquiries indicate that much steelworks expansion may be expected, including semifinished, bar and sheet mills and by-product coke ovens. Though export demand is active, most tonnage is for domestic consumption.

• • •

Battle in Congress

Congress began its special session Thursday under circumstances which promise a pitched battle on the subject of our neutrality. In the meantime (p. 24) the state department construes the British contraband order as including machinery for making any of the products on the contraband list . . . American industrial leaders, though taking no definite stand on the character of our neutrality legislation, are opposed to our taking part in war. Steel industry leaders (p. 24) believe that our participation in a fight to crush dictatorship would only result in entrenching one at home. This view also was expressed at the convention of the National Industrial Advertisers' association (p. 31) with the declaration: "Big business wants no war."

• • •

Steel Loses Leader

Steel leaders mourn the passing last week (p. 27) of Charles M. Schwab, who from humble beginnings rose to fortune, fame and power. He successively headed the country's two largest steelmaking organizations, contributed vastly to the industry's progress. Through his sparkling personality steel took on color and romance . . . Through its recent annexations Germany (p. 25) has increased its steelmaking capacity by more than 20 per cent; German analysts claim that raw materials thus gained nullify the effects of the allied blockade . . . Our war resources board is studying an industrial mobilization plan just revised by the army. One part (p. 33) provides for mobilization for war on a wartime basis and the other for such mobilization on a peacetime basis.

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Tool Show On Paper

As the best substitute for the Machine Tool Show, which was to have been held under the auspices of the National Machine Tool Builders' association, but which was called off because "the industry and its customers cannot afford the time of their key men," STEEL presents (pp. 67-146) a Machine Tool Show on Paper. It reveals the amazing versatility, and the speed, accuracy and operating convenience of modern machine tools. It shows why manufacturers generally cannot afford to overlook the advantages they can derive from availing themselves fully of modern tools and tooling methods. A leading machine tool executive discusses (p. 140) the factors that must govern in the buying and selling of machine tools if these transactions are to be on a sound economic basis.

• • •

Materials Handling

An Ohio brass foundry uses a highly developed materials handling system in which (p. 59) skid-lift power and hand trucks are co-ordinated with roller conveyors. It avoids lost motion and permits standardization on a comparatively small number of skid box sizes. . . . Slushing oils are used extensively (p. 62) to prevent rusted surfaces; a number of factors must be considered when selecting a slushing oil. . . . A new method for making three-dimensional X-ray photographs (p. 48) makes it possible to measure the depth of flaws. . . . Recent studies (p. 48) reveal that posture has an influence on the efficiency of workmen. . . . An authority reviews methods by which safety records recently have been improved (p. 50) in blooming and bar mills. . . . Steel culverts now are made (p. 54) by mass production methods.

E C Kreutzberg

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Steel Continues Upward Swing; Plant Expansions Planned

■ ACCENT is on production as some steel producers report they are sold out for the balance of the year, and others nearly so. Energies are being devoted to reconditioning facilities and raising operations to practical capacity.

Steelworks engineers and equipment suppliers say they have been "flooded with inquiries." Improvement and expansion programs held up by poor business have been dusted off and in a few instances actually are underway. Spokesmen for some companies are predicting a "boom" in steel mill expansion and renovation.

Meanwhile, available facilities are being placed in service as rapidly as possible. Steelworks operations last week advanced 5½ points to 79½ per cent of capacity. Indications are for a further increase this week in almost every district. Only exceptions are in districts now at practical capacity, or where furnaces must be taken off for repairs.

First nine months' production this year will exceed that for the entire year 1938. Output last year was 27,742,225 gross tons. For first eight months this year production totaled 25,556,179. September's output is estimated at 4,417,595 tons, based on average operating rate of 73 per cent, and indicates nine months' production of 29,973,774 tons.

Ninety per cent operations are estimated as practical capacity under present conditions. It is unlikely third quarter output will be large enough to overtake 1937 or 1936 production, although it may be not far below the latter year. In 1937, ingot output was 49,507,766 gross tons; in 1936, 46,807,780 tons.

Long-Idle Plants Resume

Long-idle and obsolete plants are resuming operations or are being prepared to resume. Some of these were marked for dismantling a year ago. A nationally known engineer estimates the cost of rehabilitating idle equipment to meet current demand will be at least $40,000,000.

At Pittsburgh, orders have been issued to recondition all available blast furnaces for blowing in as soon as possible. Thirty-three of the district's 50 stacks now are active; at least two more will be lighted this week and others are being prepared.

Increased beehive coke activity indicates the coke shortage. A leading supplier reports considerable interest in new by-product coke ovens and the possibility construction of some new units will be started before the year ends.

Bar mill capacity, it is believed, will be inadequate if the present demand continues. Some producers already are considering expansion in this department.

Sharp increase in iron and steelmaking have caused apprehension of an iron ore shortage. Fifty-two vessels were added to the ore fleet from Aug. 15 to Sept. 15; others are being commissioned. Vessels operating as of Sept. 15 were 264, highest number in commission since 1937. Of these 258 were in the ore trade. Freighters in commission Sept. 15 represent 87.13 per cent of total fleet capacity and aggregate 2,480,140 tons.

Lake ore on hand at furnaces Sept. 1 amounted to 28,365,093 tons; and at Lake Erie docks, 4,349,279 tons, a total of 32,714,372 tons. This exceeded by 4,207,129 tons the total of a month ago, but was 4,335,966 tons less than the amount on hand Sept. 1, 1938.

Russia's invasion of Poland has added greater strength to the manganese ore market in the East. Just what is the real market is not known as sellers are hesitant in making quotations. Russia has been the largest source of supply for manganese for this country, and the possibility of open hostilities between Russia and England and France is said to threaten

■ "Since the War": Action at Chicago steel plant. Nineteen thirty-seven saw all-time peak in steel employment, but production schedules are rapidly approaching highest of that year. NEA photo

American importations. Although it is possible imports can be continued despite Russia's participation, consumers who have relied on ore from the Caucasian mines are lining up other sources of supply.

Stocks in this country are ample for the present, but bona fide inquiries are numerous and the trade is looking forward to the opening of bids Oct. 19 by the treasury department for a large quantity of manganese ore under the strategic materials act. (See also p. 33). Manganese offered must not be drawn from stocks in this country but must be new imports, or domestic.

Higher demand for coal and coke by the steel and power companies and a sprinkling of export inquiry have been reflected in coal mining operations. Operators have called back several thousand men and at least 4000 more will return this week. Prices are edging upwards.

Scrap prices have advanced 30 per cent since Sept. 1.

While price reaffirmations have eased the pressure slightly, demand for finished steel continued heavy through last week. The overwhelming bulk is for domestic consumers. Deliveries generally are being regulated to protect regular customers and in some instances are limited to volume commensurate with the buyers' prior purchases.

Export prices have advanced further, increases aggregating $15 a ton on semifinished and $6 on sheets. Pig iron is holding at least $2 above the domestic market.

There has been no important buying by belligerents. In fact, it was reliably reported last week England has withdrawn its recent heavy inquiry for semifinished. Orders from neutral countries, especially South American, are expanding, but total volume continues moderate in comparison with inquiry.

At home, railroads continue to order heavily. Last week's purchases of 66,000 tons of rails brings the total for the month to more than 150,000 tons. More are pending. Car awards are heavy. Railroad rehabilitation expenditures have totaled $125,000,000 in past 60 days, according to Jesse H. Jones, federal loan administrator.

Awards for the 33 cargo vessels on which bids were received by the maritime commission last week are being made and, with merchant and naval work underway, insure continued heavy demands for ship steel.

Government steel buying under the Walsh-Healey act continues heavy. War department last week announced contracts totaling $58,585,061 for airplanes, based on previous tentative awards.

Continued rise in steelworks operations has necessitated re-employment of more furloughed workers, although widespread hiring of new men has not yet been noticed. Skilled labor is scarce. Employment services report numerous inquiries for trained workers but little increase in requirements for common labor.

Further advances in operations, however, will necessitate additions to the industry's employment, now estimated to be 460,000 to 470,000. Peak of steel employment was reached in August, 1937, when 541,000 persons were on the payrolls; operations then averaged 83.79 per cent of capacity. In April, 1937, 530,000 were employed with operations at 90.24 per cent.

Although the industry anticipates difficulty in shoving the operating rate above 90 per cent of rated capacity under present conditions, an approach to early 1937 operations and employment by year's end is considered probable.

Expansion in general industrial activity during the past month resulted in factories hiring 300,000 workers between Aug. 15 and Sept. 15, according to the United States labor department. One third of the increase was seasonal, the remainder due to increased activity occasioned by the European war.

Machines on British Contraband List

WASHINGTON

■ Great Britain's contraband list, published shortly after her declaration of war against Germany includes not only articles listed, but also any machinery designed for manufacture of those products. Machinery division, department of commerce, last week called American machine builders' attention to this interpretation, to prevent misunderstanding and forestall loss of such equipment.

"War Would Mean Dictatorship"

■ "Apparently there are some in this country who would send American soldiers to the battlefields of Europe, to help put down dictators and save the world for democracy all over again. I wonder if they have thought through to the consequences of our joining in another foreign war, particularly with the government under the influence of the economic ideas now pervading it. As certain as night follows the day, while we were fighting to crush dictatorships abroad we would be entrenching one at home.

"Our participation in another World war would mean a death blow to individual freedom in the United States. Life would be rigorously regimented. Industry would lose the last vestige of private control. Labor would take orders from government bureaucrats. And when the war ended those controls would not soon be lifted. The economic and political bankruptcy of the country would be complete. Perpetuation of dictatorship would appear as the only answer."—*Tom M. Girdler, chairman, Republic Steel Corp., in presidential address before American Iron and Steel institute, New York, May 25, 1939.*

■ "Important though it is, there is something more important than material prosperity. . . We cannot halt the progress of autocracy by copying its methods. Rather, the great contribution we can make to world sanity and world peace is to demonstrate to peoples now living under the illusions of the dictator countries that it is possible for a nation to be both politically free and economically prosperous.

"Let us guard against any circumstance that will further centralize power in this country. Let us, as a people, keep our heads. Let us guard particularly against anybody sweeping us into war hysteria. For war, more than anything else, holds danger of actual dictatorship for America, in addition, of course, to its inevitable destruction of life and property; its threat to continuance of the basic principles on which American life is founded. Let us fight to keep the United States, in every sense, a free country."—*Ernest T. Weir, chairman, National Steel Corp., Pittsburgh, new president, American Iron and Steel institute, in address before Weir-Cove chamber of commerce, Weirton, W. Va., April 18, 1939.*

B. H. Lawrence Now U. S. Steel Vice President

■ B. H. Lawrence, formerly chief engineer, has been elected vice president in charge of engineering, United States Steel Corp. of Delaware, and a member of its executive committee and board of directors.

With the exception of three years immediately following his graduation from college, Mr. Lawrence has been connected with U. S. Steel subsidiaries during his entire engineering career. He has served in executive engineering capacities in the Chicago, Worcester, Mass., and Cleveland districts, and has been chief engineer of U. S. Steel of Delaware since Jan. 1, 1938.

Germany Gains Substantial Minerals, Manufacturing Resources in Poland

■ BY HER CONQUEST of Poland, Germany gains at least partial control of Europe's seventh largest steel producer, a great wealth of mineral resources, a 150,412-square mile country which normally grows a surplus of food, at least a partial answer to the reich's acute labor shortage. German analysts last week contended these gains may enable the reich's industries to maintain production despite the allies' blockade.

Poland's natural wealth is greater than that of the former Czechoslovakia, Rumania, Switzerland, Yugoslavia or Hungary, according to an estimate by Dr. Roman Gorecki, president, National Economic Bank, Warsaw. Poland in Europe was inferior only to Great Britain, Germany, Russia, France and Italy.

Her resources: Coal reserves estimated at 62,000,000,000 tons, twice the French reserves. Coal output has been the fifth largest in Europe, after Great Britain, Russia, Germany and France.

Zinc and lead reserves estimated 33,000,000 tons. Poland has been third largest zinc producer in Europe.

Mineral oil reserves estimated at 160,000,000 tons. The country, with 1937 production of 3,700,000 barrels, was Europe's third largest producer, although not comparable with Russia and Rumania. Forty per cent of her output normally was exported.

Iron ore reserves of 160,000,000 tons are located conveniently near the coal deposits in the southwestern part of the country. Most of the ore is low-grade and domestic ore has supplied only about half the country's steel industry's requirements. Domestic ore production in 1937 was 763,780 tons, an all-time record. In the same year 651,000 tons were imported. Poland also imports scrap and manganese.

Iron ore likely will continue a difficult problem for Germany, especially if her imports from Sweden are stopped. Completion of the Hermann Goering steelworks, designed to utilize the low-grade South Brunswick ores, is expected to bring some relief next spring or summer.

Poland's steel industry has been moderately developed in recent years, and a considerable portion of output has been exported. Her pig iron and steel production for past ten years:

Poland's Iron, Steel Output
(Gross Tons)

Year	Steel	Pig Iron
1938	1,550,000	965,000
1937	1,433,000	712,000
1936	1,123,000	575,000
1935	930,000	388,000
1934	831,000	376,000
1933	805,000	301,000
1932	542,000	196,000
1931	1,020,000	341,000
1930	1,217,000	470,000
1929	1,355,000	693,000

These figures, however, do not tell the complete story as it existed just before hostilities started. When Czechoslovakia was partitioned last fall, Poland acquired that country's richest coal, iron and steel prize, the Teschen district.

Here is located the extensive Ostrava-Karvinna coal field, with normal production of 12,000,000 to 13,000,000 tons, and nearly 2,000,000 tons of coke.

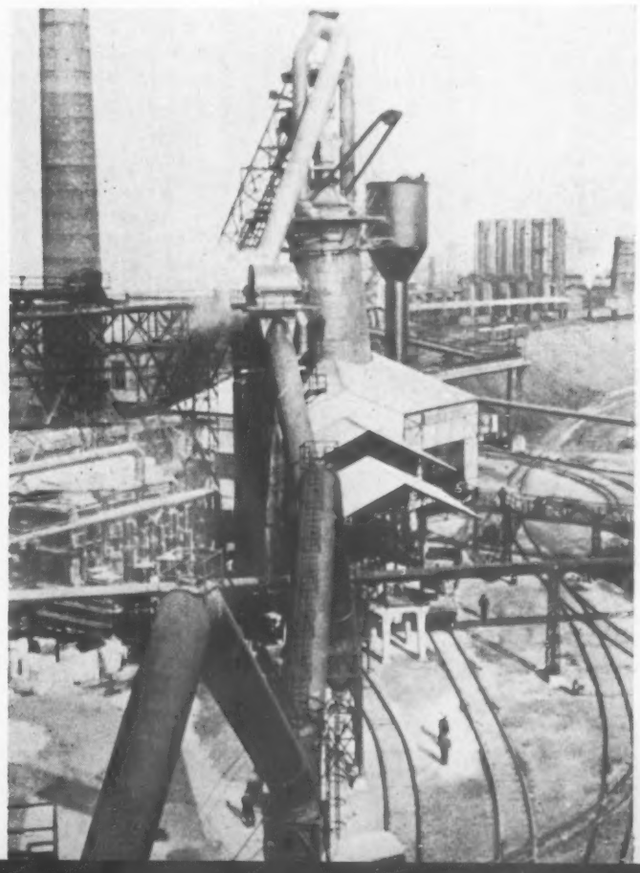
Also in that district is one of the largest steel and iron works in central Europe, the former Czechoslovak Mining & Iron Co. at Trinec. The works' capacity is in excess of 500,000 tons of steel and 500,000 tons of pig iron annually.

Poland also acquired the Oderberg wire mills, owned by the Trinec company, and the Albert Hahn tube works. Since the production of these mills is included in the listed production by Poland only for the last quarter of 1938, allowance must be made for their capacity in the present computation of Poland's resources.

When the state was established

Polish Furnace, Foundry

■ **Poland will materially swell the the industrial resources under Germany's control. Europe's seventh largest steel producer, Poland last year produced 1,550,000 gross tons. She has substantial reserves of iron ore, coal, oil, lead and zinc. Shown at left is a Polish steel foundry with its roll-casting pits; at right, recently built blast furnace of American type**



21 years ago, its industries had been ravaged by the World war. The old industries have since been reconstructed and many new ones, including automobile and truck, aircraft, railway equipment, tools and machinery, electrochemical, arms and munitions factories, established.

The country's mineral resources, however, have not yet been fully developed and are believed capable of much higher production.

German annexations within the past two years have increased her steelmaking capacity more than 20 per cent. Countries seized produced 4,327,000 gross tons of steel in 1937, of which 640,000 was by Austria, 2,254,000 by Czechoslovakia, and 1,433,000 by Poland. Alsace-Lorraine, which was returned to France in 1919, produced 2,574,000 metric tons of steel in 1937.

Primarily Poland is an agricultural country with 65 per cent of its area and 65 per cent of its population so engaged. Normally it produces considerable surpluses of cereal grains, meats, sugar and other products badly needed by Germany. A favorable balance of exports over imports has been a custom with Poland.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Sept. 23	Change	Same week 1938	Same week 1937
Pittsburgh ..	75	+ 5	38	73
Chicago	78.5	+11.5	43.5	79.5
Eastern Pa...	59	+ 2	33	63
Youngstown..	82	+ 7	48	70
Wheeling	88	+ 2	54	82
Cleveland ...	84	+ 1	48.5	64
Buffalo.	72	+ 5	49	74
Birmingham..	83	+ 3	57	83
New England	80	+ 5	60	75
Cincinnati ..	71.5	+ 3.5	65	89
St. Louis.....	66.5	+ 4.5	48.5	74
Detroit	99	None	77	100
Average....	79.5	+ 5.5	48	76

PRODUCTION

■ STEELWORKS operations last week advanced 5.5 points to 79.5 per cent, highest since the middle of September, 1937. Eleven districts showed increased production and one remained stationary. A year ago the rate was 48 per cent; two years ago 76 per cent.

Chicago—Increased 11.5 points to 78.5 per cent, two producers being at capacity and four others gaining. More open hearths and blast furnaces will be added this week.

St. Louis—Up 4.5 points to 66.5 per cent, one open hearth being added. This is the highest rate since September, 1937.

Birmingham, Ala.—Rose 3 points to 83 per cent on lighting of another open hearth by Republic Steel Corp. Three blast furnaces have been blown in, all 18 stacks in this district being active.

Buffalo—Advanced 5 points to 72 per cent, with further increase indicated this week.

Central eastern seaboard—Up 2 points to 59 per cent. This week's schedule will be higher.

Cincinnati—Gained 3.5 points to 71.5 per cent.

Cleveland—Averaged 84 per cent, and probably will be higher this week.

Wheeling—Up 2 points to 88 per cent.

Pittsburgh—With production up 5 points to 75 per cent, indications are the rate will go about 10 points higher before leveling off. Pittsburgh Coke & Iron Co. will blow in its blast furnace at Sharpsville, Pa., and Carnegie-Illinois Steel Corp. has resumed blowing a blast furnace banked since last spring.

Youngstown, O.—At 82 per cent, 7 points above the preceding week, practically all available units are in operation. Recession to 80 per cent is expected this week as one bessemer and one open hearth go out for repairs. Carnegie-Illinois Steel Corp. and Youngstown Sheet & Tube Co. each will add a blast furnace. Republic Steel Corp. has blown in its remaining stack.

Detroit—Steady at 99 per cent for third week.

New England—Advanced 5 points to 80 per cent. Additional gains are in prospect.

Thyssen, in the War News, Germany's "Powerful Statesman of Steel"

■ FAMED German industrialist Fritz Thyssen, high in Nazi councils for many years, was reported last week to have fled the country. Whether this report is true or not, only time will reveal.

Wielding tremendous power as head of the Ruhr steel combine (United Steelworks) and economic dictator over Rhenish Westphalia's coal and iron ranges, Thyssen long has been known as one of the "men behind Hitler," was among his earliest friends and supporters.

Following der fuehrer's accession to power, Thyssen became "leader of heavy industry" under the economic reorganization program, and as a member of the Reich's Grand Economic council and Prussia's State council was officially a Nazi "brain-truster."

Indomitable, exacting and efficient, Thyssen was the nation's statesman-industrialist. So powerful was his influence upon inner councils that Hitler's Third Reich often has been termed Thyssen's Germany.

Now past 60, Thyssen was born in the Ruhr, at 19 was member of a coal mine's board of directors. During the French occupation he was court-martialed and imprisoned for refusing to comply with French regulation of his father's steel concern. The occupation over, Thyssen became sole master of his father's realm, extended steadily his control over the steel industry. His was the first German industrial group to float a long-term mortgage loan in the United States after close of the inflation period.

Fritz Thyssen

Active in organizing Germany's Raw Steel association, Thyssen resigned in 1930 after serving as its chairman for ten years.

Foundry Equipment Orders Rise in August

■ Foundry equipment orders, shipments and unfilled orders in August were higher than in July and far above those of August, 1938, according to the Foundry Equipment Manufacturers' association, Cleveland. Comparisons follow, indexes based on 1922-1924:

	Aug. 1939	July 1939	Aug. 1938
Net orders	131.4	111.9	83.3
Shipments	143.8	135.5	89.1
Unfilled orders	123.1	135.6	102.8
3 mos. av. gross orders	126.8	118.6	73.6

Industry's Leaders Pay Tribute to C. M. Schwab

"Outstanding Figure in Steel of Past Fifty Years"; "His Life Proves Soundness of American Way"

(From expressions gathered by STEEL)

■ Mr. Schwab, 77, attended the American Iron and Steel institute meeting last May. At the close of his reminiscences and optimistic predictions for the future of the industry the audience rose and cheered

George M. Verity, chairman, American Rolling Mill Co., Middletown, O.—"Charles M. Schwab is the outstanding figure in the development of the great iron and steel industry of the United States during the past 50 years.

"His initiative, courage and undefeatable optimism were always outstanding factors in carrying the industry through many periods of adversity as well as those of constructive accomplishment.

"His rise from most humble beginnings to the commanding position he occupied, and what has transpired in our national, industrial, social and cultural development during his lifetime, are certainly ample proof of the soundness of our American system of free enterprise."

L. E. Block, chairman, Inland Steel Co., Chicago—"He had the happy combination of being highly skilled as an operator of steel plants as well as a great salesman, and a capable administrator of the commercial side of the steel business. He was a genial soul with a magnetic personality, and he had a host of friends."

Ernest T. Weir, chairman, National Steel Corp., Pittsburgh—"In the death of Mr. Schwab the steel industry has lost one of its greatest leaders, and a picturesque character who has exercised a constructive influence on the industry for many years; an outstanding example of the great opportunities afforded to youth in America through its system of free enterprise."

B. F. Fairless, president, United States Steel Corp., New York—"In the passing of Mr. Schwab America has lost a great citizen and the steel industry an outstanding leader. Mr. Schwab was a genius of the steel age. . . His life was an amazing chapter in the history of industrial America."

William A. Irvin, director and member finance committee, United States Steel Corp., New York—"The contribution to society of a man of Mr. Schwab's stature cannot be measured solely by the listing of his well-known accomplishments in helping to build up the American steel industry to its pre-eminence. His kindly good humor created within the industry a friendly spirit of co-operation which has served as a model to others."

James A. Farrell, former president, United States Steel Corp.—"Industrial America has lost an inspiring leader in the passing of Charles M. Schwab. He belonged to a period that witnessed the rise of the United States as a manufacturing country, and in which the index of steel production came to be regarded as an index to general economic progress.

"I like to think of him as I knew him at Braddock, when we were working in separate plants and frequently walked home together after the day's toil. What he was then, in genial companionship, in serious contemplation of the future of American industry, and in rich endowment of attractive personal qualities that won him a host of friends, he remained to the close of expanded years that crowned his lifework as one of the makers of industrial America."

E. G. Grace, president, Bethlehem Steel Co., Bethlehem, Pa. — "Mr. Schwab was a pioneer in realizing the importance of the human element in industry, believing in encouragement and opportunity for every employe. He proved by experience that praise brings out the best in men; and he discarded the slave-driving tradition once prevalent in industry in favor of a policy of commendation and reward for work well done.

"Mr. Schwab was always a solid and enthusiastic believer in the future of America. His early predictions on the growth of the steel

■ Mr. Schwab at the age of 39 when he became the first president of the United States Steel Corp. in 1901

industry were thought fantastic and yet he lived to see most of them come true. He stood for American principles, for the American way of life, and he continuously affirmed that if America retains her tradition of enterprise, the progress of the country will be assured."

J. L. Perry, president, Carnegie-Illinois Steel Corp., Pittsburgh—"Mr. Schwab's contributions to Carnegie Steel Co. in his early days, and his influence in its affairs, are outstanding in this great company's history. His forceful and magnetic personality is remembered with affection by all who have had the good fortune of being associated with him. He will be remembered for his human qualities of kindness, generosity and friendliness."

T. M. Girdler, chairman, Republic Steel Corp., Cleveland—"When Mr. Schwab died, the steel industry and the nation at large lost a great leader. He personified the American business man, courageous, farsighted, optimistic and considerate. .

"His passing is a tragedy, especially at this time when clear, constructive thinking is so essential."

F. B. Hufnagel, chairman, Crucible Steel Co. of America, New York —"Mr. Schwab's death is not only a severe loss to his many personal friends and business associates but also an irreparable loss to the entire steel industry."

Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.—"Mr. Schwab in his early days soon caught the gleam of the spirit of this country, which at that time was nothing more nor less than that all work is honorable, and that he is an artisan who loves his work and does it well. No limits of race or creed or country circumscribed his sympathies. His nature was all-embracing. He preached and practiced the gospel of kindness."

R. W. Wolcott, president, Lukens Steel Co., Coatesville, Pa.—"The passing of Charlie Schwab removes from our midst one of the most colorful personages ever associated with the steel industry. His career and life will always be an inspiration to those of us who believe in democracy."

Frank Purnell, president, Youngstown Sheet & Tube Co., Youngstown, O.—"To me, Mr. Schwab has been outstanding in his constant faith for a favorable outlook over the long range for the steel business, and the United States as a whole. He was an inspiration to me and thousands of others."

Henry A. Roemer, president, Sharon Steel Corp., Sharon, Pa.—"The passing of Charlie Schwab is a distinct loss to the steel industry, to labor, and to the country generally. His contributions to the progress and development of this great industry have been outstanding, and the fine quality of his leadership will be seriously missed in the difficult days immediately ahead."

Arthur Roeder, chairman, Colorado Fuel & Iron Corp., Denver—"He had the rare faculty of making new acquaintances feel like old friends. His contributions to the steel industry in the United States are too well known and too numerous to list."

H. E. Lewis, president, Jones & Laughlin Steel Corp., Pittsburgh—"It was my privilege to be associated with Mr. Schwab for more than 25 years. His understanding and kindliness, his initiative and vision stamped him as outstanding."

E. J. Kulas, president, Otis Steel Co., Cleveland — "America has known few men who had a finer understanding of human values or a keener sense of enterprise than Charles M. Schwab. As one who climbed the ladder of success from the very bottom to the top he knew and understood most of the problems which at one time or another confront all of us."

Hayward Niedringhaus, president, Granite City Steel Co., Granite City, Ill.—"In Mr. Schwab's passing the steel industry in particular and American business in general has lost one of the few survivors of that coterie of American geniuses whose ability, foresight and love of accomplishment made possible the America of today."

William J. Priestley, vice president, Electro Metallurgical Co., New York—"The entire steel industry will mourn the loss of Mr. Schwab, who for so many years was looked upon as its dean. Like all others who have ever worked for him, I shall cherish the memory of his kindly ways and inspiration."

From Laborer to Top Management of Two Largest Steel Producers

■ CHARLES M. SCHWAB, chairman of the board, Bethlehem Steel Corp., died Sept. 18 at his Park avenue apartment in New York. Mr. Schwab, who was 77, returned from Europe Aug. 31 invalided by a severe attack of coronary thrombosis.

Mr. Schwab entered the steel industry at a time when ingot production was less than 1,500,000 tons annually, when Lake Superior ore shipments were less than 2,000,000 tons a year, when a ton of steel was just a ton of steel and statisticians dealt with the products of forges and bloomeries rather than rolling mills. He had a leading part in its expansion to 73,000,000-ton ingot capacity; in forming of today's vast organizations; in bringing about the age of "tailor-made" steels and alloys.

Paralleling the industry's tremendous expansion was the man's personal rise to fortune, fame and power. Master of men and machines, he rose from a laborer to top management of the two largest steel-producing units in the United States.

In the admiring eyes of many, Mr. Schwab embodied all the big virtues and few of the little flaws of executive and managerial genius. Always he was an optimist, a patriot, hard-fisted and hard-headed, sentimental, kindly and friendly.

He knew human nature and how to handle it. He knew steel, how to make it and how to sell it.

Countless legends clustered about him. Some were true. Others, when related to the man himself, brought the famed Schwab smile. He was "the man who tore up a $1,000,000 salary contract in the face of J. P. Morgan." He was "the man who spurned a proffered $100,000,000 bribe from the German government during the World war."

Born in Williamsburg, Pa., Feb. 18, 1862, Mr. Schwab was educated at

St. Francis college in Loretto, Pa., which in those days had the equivalent of no more than a high school curriculum. When he had finished his schooling at the age of 17, his father, a woolen manufacturer and country banker, sensing the boy's abilities, advised him to seek opportunity outside the village of Loretto to which the family had moved.

A friend and neighbor, by name of Spiegelmire, was opening a grocery store at Braddock, Pa., where the Edgar Thomson Steel Works was the chief industry. The lad was offered and accepted a job as utility boy in the new store.

Turning point in his life came when Capt. Bill Jones, general manager of the Thomson works, stopped at the store to buy tobacco. Young Schwab mustered his courage: "Captain Jones, would you give me a job in the steelworks?"

Captain Jones laughed at the assertiveness of the green country boy. "Come up to my office," he replied, and gave the lad a note to Labor Boss Tom Cosgrove who gave him a job as general utility laborer with the engineering corps. He borrowed books from the engineers, gained a knowledge of logarithms and other details needed in surveying.

From this job grew the legend that Mr. Schwab started in the steel industry as a stake driver. "I do not remember ever having driven a stake," he later said.

Two years after starting at the Thomson works, the 19-year-old youth was named chief engineer and assistant to the general manager. In his new position, he endeared himself to Captain Jones, to whom he had not spoken since the day he was employed. Captain Jones was a rule-of-thumb, trial-and-error engineer who, nevertheless, had a fertile mind and had invented the Jones mixer and many other devices still used in steel mills.

Realizing the opportunity that now was his, Mr. Schwab applied himself to the engineering job with redoubled energy. Uses of chemistry and physics in predetermining the qualities of steel were just becoming known. This phase of the business was a closed book to Captain Jones, and Mr. Schwab saw a chance to make a real contribution to the plant.

He needed a laboratory. Money was the problem. He had just married Emma Eurana Dinkey (May 1, 1883) and expenses of setting up a home were straining the budget. With $1000 borrowed from Henry Phipps, a colleague of Mr. Schwab and a close friend and associate of Andrew Carnegie, a laboratory was established in Mrs. Schwab's sewing room. Her father had been a chemist and she eagerly sympathized with her young husband's scientific interest.

Chunks of steel were brought home from the mill and analyzed for their various properties. A frequent visitor was Captain Jones, whose enthusiasm for his youthful chief engineer grew steadily. The practical possibilities revealed in the laboratory amazed and delighted him.

Mr. Schwab was equally alive to the mechanical developments possible in the mills and added a number of labor saving devices.

Six years passed and Andrew Carnegie acquired the Homestead Steel Works. He came to Captain Jones for a recommendation for a new superintendent.

"Charlie is the man," Jones replied, and the 25-year-old Schwab was placed in charge of one of the largest plants in the country. Further promotion was ahead. Captain Jones was killed in a blast furnace slip in 1889 and Mr. Schwab was named his successor as general superintendent of the Thomson works.

From that time on a new phase of Mr. Schwab's talent became noticed—managing men. His magnetic smile, his contagious optimism, his tact and encouraging friendliness were strongly needed in an industry where capital and labor were to battle fiercely. After the Homestead strike, feelings still ran high. Mr. Carnegie cabled from Scotland instructions to place Mr. Schwab in charge of the Homestead plant

Schwab Chronology

1862, Feb. 18—Born at Williamsburg, Pa.

1879—Entered service of Carnegie companies, as laborer in engineering corps, Edgar Thomson Steel Works.

1881—Chief engineer and assistant general manager, Edgar Thomson Steel Works.

1887—Superintendent, Homestead Steel Works.

1889—General superintendent, Edgar Thomson Steel Works.

1892—General superintendent, Edgar Thomson and Homestead.

1897—President, Carnegie Steel Co. Ltd.

1901—President, United States Steel Corp.

1905—President and board chairman, Bethlehem Steel Corp.

1916—Board chairman, Bethlehem Steel Corp.

1918—Director-general, Emergency Fleet Corp.

1927—President, American Iron and Steel institute.

1928—Awarded Bessemer medal by Iron and Steel institute (Great Britain).

1930—Awarded Gary medal by American Iron and Steel institute.

1939, Sept. 18—Died in New York.

■ Mr. Schwab donned working clothes and felt at home, left, as he tested a machine at the National Steel and Machine Tool exposition, Chicago, in 1926. Below, he is shown speaking to a crowd at a ship launching during World war days. Photos, Underwood & Underwood and Central News

◆

again. When the youthful superintendent had been at Homestead before his problems had been those of production. Now they were those of dealing with men.

He determined to bring peace to Homestead and to do it quickly. Frequently he was on the job for 72 hours at a stretch, sustained by brief naps. He visited men on both day and night shifts in the plant, getting acquainted with the workers personally. He listened to their grievances, visited their homes, established a new basis of relationship.

His Success Pleases Carnegie

Andrew Carnegie was overjoyed at Mr. Schwab's success, soon offered to make him a vice president.

"I do not want to be a vice president, Mr. Carnegie," he replied, "because in that position I would be second man and I would be no good, but as manager of all these works I am very happy, and I prefer to stay manager." Promptly Mr. Schwab was named president of Carnegie Steel Co. Ltd.

He had become a world figure. In three years he raised the company's profits from $7,000,000 to $40,000,000, his bonus from 1/3 of 1 per cent to 6 per cent. An English concern offered Mr. Schwab $1,000,000 annual salary if he would go to that country and take charge of its plants. Mr. Carnegie countered with a five-year contract at $1,000,000 a year.

But Mr. Carnegie was becoming eager to retire and the era of mergers in steel was underway. Only financial interest strong enough to buy out Carnegie was J. P. Morgan. And Mr. Morgan was skeptical of the profit possibilities of steel.

Others interested in a merger arranged a dinner of notables at the University club in New York, Dec. 12, 1900. Mr. Schwab, the chief speaker, pictured a future for the steel industry which convinced even the skeptical Mr. Morgan. With Mr. Schwab as chief intermediary between Carnegie and Morgan, an agreement was reached for the Morgan interests to buy the Carnegie holdings, and the United States Steel Corp. was born.

Mr. Morgan's condition was that Mr. Schwab should continue as president of U. S. Steel. But Mr. Morgan demurred to Mr. Schwab's $1,000,000 annual salary. When so informed, Mr. Schwab took the contract from his pocket, tore it into pieces. A new contract providing $100,000 salary and 2 per cent of profits if they exceeded $70,000,000 was signed. The following year Mr. Schwab drew more than $2,000,000.

"Too many bosses," he said, was his difficulty as president of the Steel corporation. He longed to act on his own initiative, and the interference by directors irked him. In 1903 he retired.

As early as 1901, Mr. Schwab had acquired an interest in the Bethlehem Steel Co., an enterprise at Bethlehem, Pa., which specialized in the manufacture of ordnance. On Dec. 10, 1904, he organized the Bethlehem Steel Corp. to take over the Bethlehem properties, and installed himself as chairman of the board and president.

At last he had unlimited opportunity to put his ideas into actual practice and he devoted himself to building up Bethlehem. Within a year he had organized a strong group of executives to assist him, including Archibald Johnston, Henry S. Snyder, Barry N. Jones, F. A. Shick and Eugene G. Grace.

Bethlehem soon entered the structural field, built a new plant to roll Bethlehem beams. All through the period of building construction which preceded the World war Bethlehem forged ahead as a leader in making steel for skyscrapers.

Came the war and Mr. Schwab crossed the Atlantic, returned with huge orders to supply steel to Great Britain, Russia and other Allies. He won the gratitude of Allied leaders for furnishing the equipment necessary to win the war. It was at this time the Kaiser was reported to have offered Mr. Schwab $100,000,000 in gold if he would break his contract with the Allies, which was refused.

Dollar-a-Year Man in War

When the United States entered the war, President Wilson drafted Mr. Schwab as a dollar-a-year man to serve as director-general of the Emergency Fleet Corp. Mr. Schwab threw himself into the conflict with zeal. In his shipbuilding experience as in his own plants he mixed with the workmen and personally spurred them on.

When peace returned, Mr. Schwab's dream of Bethlehem as a vast producer of commercial steel had to be built up anew. Responsibility for this task he entrusted to his associates. He advised, but held firm to the principle of non-interference.

Although he was a director in many industrial and financial organizations, Mr. Schwab's first pride was Bethlehem. "I love Bethlehem; it is the achievement of my life," he declared.

A practical engineer, largely self-taught, Mr. Schwab has been honored with degrees from many colleges. In 1925 he received the Cross of the Legion of Honor at Paris. In 1928 he was awarded the Bessemer medal of the Iron and Steel Institute of Great Britain, and in 1930 the Gary medal by the American Iron and Steel institute. He served as president of the latter organization from 1927 until 1932.

Mr. Schwab moved quietly to use his millions for good deeds. A friend relates that during the middle twenties he said to his wife: "We have had a good year and you can have $2,000,000 to do what you please with."

Next morning she asked: "Charlie, did you mean what you said last night?" He did. Mrs. Schwab took the $2,000,000 and started a home for boys on Long Island. Not a word about it appeared in the newspapers.

During his career Mr. Schwab never missed an opportunity to speak of the great assistance given him by his wife and to give her due credit for his success. Following her death last January, after they had been married 56 years, Mr. Schwab closed the famous home on Riverside drive, New York, had been ill and lonely since.

The steelmaster's benefactions were chiefly religious and educational, although he had a long list of pensioners. It was characteristic of the man that having built a school or church, he would turn over its management to educational or religious authorities, never attempting to mold its operating policy.

Mr. Schwab possessed a rare vision and was not afraid to act. During the panic of 1907, he was considering a mill costing millions to produce structural beams. His associates tried to dissuade him. Mr. Schwab felt it was a chance worth taking. "If we go bust," he said, "we will go bust big." But he didn't.

Only day of his life he admitted he would have liked to have lived over again was the day the Wright brothers came to him for backing in their development of the airplane, and he refused.

Famed was Mr. Schwab's gift for inspiring men. He handled some tenderly, some roughly; he piqued their pride, pampered with praise; he was an exponent of the incentive system as means to make men produce more.

Schwab Was Resourceful

While superintendent of the Homestead and Thomson works, one of his foremen was not getting maximum production. Schwab dropped by near the end of the turn. "How many heats today?" "Six" was the reply. Mr. Schwab chalked the figure on the furnace, passed along without another word.

When the night shift came on they noticed the "6" and asked about it, were told of the big boss' action. Next morning when the young superintendent came into the mill, the "6" had been rubbed out and a chal-

(*Please turn to Page* 164)

Industrial Advertisers Hear Pleas For Nation's Strict Neutrality

■ AMERICA stands to lose not only her economic equilibrium but her form of government if she allows herself to become involved in a war, declared John A. Zellers, vice president, Remington Rand Inc., at the opening session of National Industrial Advertisers' association's seventeenth annual conference, Hotel New Yorker, New York, Sept. 20-22.

Pointing to other nations successfully remaining aloof from Europe's complicated affairs in his keynote address on "Waves of World War Trade," Mr. Zellers urged vigorous defense of our own neutrality. "Big business wants no war," he asserted. "Steel and other heavy industries are organized for peace. We have seen and experienced the great depressions which follow war booms.

"Let us deal with domestic problems before venturing to remodel the rest of the world. Right here at home a vast reservoir of prosperity waiting to be tapped challenges our ingenuity. This hemisphere is our place and here is our destiny," said Mr. Zellers, calling for rededication to the principles of the Monroe doctrine.

Great opportunity lies for neutral American business in foreign markets, he indicated, although trade may be limited with countries lacking means to buy. Major economic responsibility in stimulating wider markets for our vast resources today is shared by the sales manager, advertising manager and public relations counsel, he said.

Nearly 1000 members from the association's 18 chapters were welcomed by Conference Chairman E. A. Phoenix, Johns-Manville Corp.; Mayor Fiorello H. La Guardia; and N.I.A.A. President Stanley A. Knisely, advertising manager, Republic Steel Corp., Cleveland.

Warns Against Boom's Dangers

Surveying recent growth of industrial advertising, Mr. Knisely stated the association should be grateful for "lessons learned in the past ten lean years. Let us beware of any so-called boom years that may lie ahead, lest we again become soft, slip into the same old rut and lose the strength and desire to crawl out."

Speaking on "The Industrial Economic Outlook," at the Wednesday morning session, Lionel D. Edie, president Lionel D. Edie Inc., New York, predicted industrial production during the next six or eight months may attain an average level of 123 as measured by the federal reserve board index. This would be close to 1929 peaks.

Europe's war has not been the fundamental cause of current business expansion, Mr. Edie asserted. He characterized recent weeks as a period of "inventory scramble" in anticipation of higher costs, and after higher prices have been passed on to consumers some liquidation is likely. Substantial business cannot be expected from belligerents, he believes, although increased South American trade should offset any losses in Europe.

Directing remarks to the Wheeler-Lea act as it affects industrial advertising, J. A. Horton, chief examiner for the federal trade commission, encouraged association members to co-operate with the commission in its fair competition program.

"Congress is confronted with the widespread desire to help the Allies win the war and at the same time keep this country out," said Prof. Raymond Moley, in a luncheon address on "The Outlook for America." Although this nation has not the instinctive habit of neutrality, he declared, true sentiment is for maintaining peace.

Hold "Shirt-Sleeve" Clinics

Following Wednesday's general sessions the conference divided into four "shirt-sleeve" clinics, 16 being organized for the three days to deal with special advertising and sales promotion problems.

Presiding over Thursday's session was Charles McDonough, general conference committee vice chairman. Speakers included: Prof. Ross M. Cunningham, Massachusetts Institute of Technology; Bernard C. Duffy, vice president, Batten, Barton, Durstine & Osborn Inc.; S. L. Meulendyke, vice president, Marschalk & Pratt Inc.; and L. G. Beane, sales manager, Bristol Co.

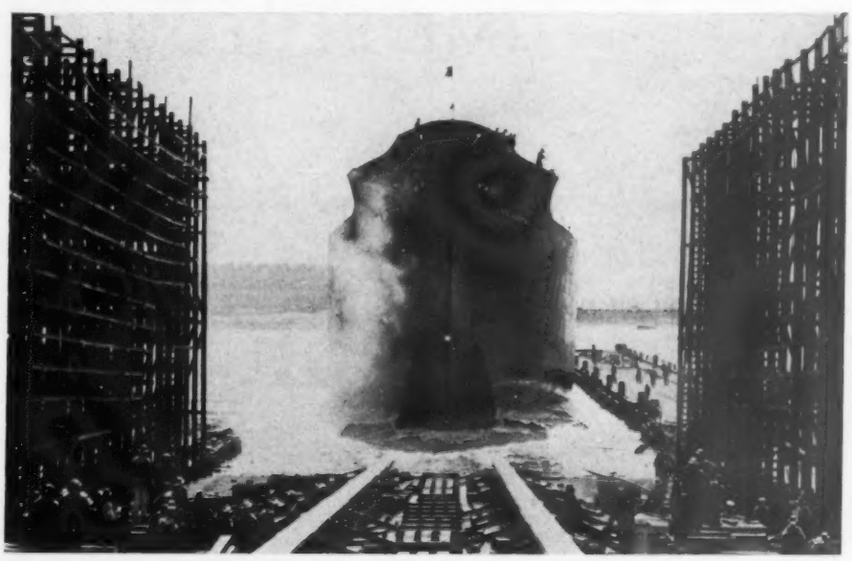
Association's annual banquet was held Thursday evening.

Friday session was headed by Richard S. Hayes, president, Industrial Marketers of New Jersey. Speakers: William D. Murphy, Sloan Valve Co.; R. P. Dodds, Truscon Steel Co.; F. O. Wyse, Bucyrus-Erie Co.; D. A. Wolff, industrial advertising counsel.

Displays were prepared by 61 exhibitors for the annual exposition.

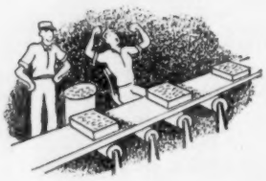
Charles McDonough, Combustion Engineering Co., New York, was elected association president. Vice presidents: Richard P. Dodds, Truscon Steel Co., Youngstown, O.; W. D. Murphy, Sloan Valve Co., Chicago; H. S. Van Scoyoc, Canada Cement Co., Montreal, Que.; Perry Mitchell, Frick Co., Waynesboro, Pa.; H. V. Mercready, Magnus Chemical Co., Garwood, N. J.; E. J. Goes, Koehring Co., Milwaukee. R. Louis Towne, Surface Combustion Corp., Toledo, was elected secretary-treasurer.

Largest Ship Launched on West Coast in 20 Years



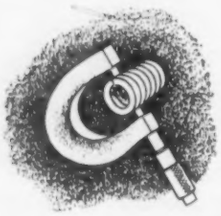
■ **Virtually dormant since World war days, West coast shipyards today are stirring into life under the maritime commission's program for rebuilding our merchant marine. Recently launched in San Francisco bay was the $3,000,000 "Sea Arrow," largest commercial vessel built by a Pacific yard in 20 years. A C-3 cargo and passenger type, the 12,000-ton ship is 495 feet long with 62-foot beam. She is to join the new fleet of the American President Line. Wide World photo**

TO THE RESCUE OF STALLED

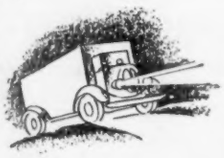
PRODUCTION  LINES COME

BARNES-MADE SPRINGS SMALL

STAMPINGS WIRE FORMS

 ACCURATE TO SPECIFICATIONS

SAVING INSPECTION DELAYS

MEETING YOUR  TIME SCHEDULES

GET A BARNES QUOTATION

ON YOUR PRODUCTION PARTS

WALLACE BARNES COMPANY

BRISTOL CONNECTICUT DIVISION OF THE ASSOCIATED SPRING CORPORATION

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ SPECIAL session of the 76th congress, to be known officially as the second session, convened last Thursday. Administration circles hope it will be a short one, that a satisfactory neutrality law will be formulated and that congress will adjourn until the regular session, Jan. 3, 1940.

It is to be remembered that the status of all bills, resolutions and investigations is exactly the same as on Aug. 5, when the first session adjourned. Legislation, at adjournment, of special interest to the steel industry, was summarized in STEEL, Aug. 7.

Washington newsmen, familiar with habits and reactions on capitol hill are firmly of the opinion this will be a "dirty" session of congress. This feeling emanates from the fact that propaganda for both sides of the neutrality question will deluge members. President Roosevelt, superficially at least, is making an effort to have politics adjourn during the neutrality discussions, but whether this can be accomplished or not is a matter for conjecture.

Just Neutrality Action—Roosevelt

In addition to political aspects, there are members of both houses of congress, especially in the senate, who have decided opinions on the question and who will insist upon having plenty of time for full discussion of the matter. Whether other matters will be discussed is as yet impossible to foretell.

Up to the time this was written, the President insisted the only action he wants is on neutrality and that he has no desire for anti-profiteering legislation or any additional powers in this "emergency" other than he already possesses. On the other hand, there are influential members in both houses of congress who want to stay in session at least until the new session begins in January; some extremists want congress to be in Washington for the duration of the European conflict.

WAR DEPARTMENT RELEASES MOBILIZATION PLAN

Great interest attaches to the 1939 industrial mobilization plan which has just become available here through the war department. Edward R. Stettinius Jr., chairman, United States Steel Corp. and chairman of the war resources board, is studying the plan for further revision and amplification.

The report is divided into two parts, the first dealing with utilization of natural resources and mobilization of industry in time of major war, the second with army and navy procurement planning in time of peace.

Under part one, war department officials have taken up co-ordinating measures, organizational plans and war resources administration. It also contains detailed plans for war service committees, post-war readjustment, and other emergency administrations. Part two deals with procurement in peacetime, policies, organization through peacetime planning, and the army and navy munitions board.

This is the third published revision of the industrial mobilization plan. The first was submitted to the war department by the war policies commission in 1931. For ten years previously studies had been conducted by the war and navy departments, working for effective and equitable utilization of industrial resources.

Wartime Mobilization Only

This industrial mobilization plan, as the name implies, is to be a guide available in time of war and would apply only for the duration of a war. It attempts to anticipate difficulties experienced by United States during the first World war, aims to overcome such difficulties promptly and effectively in any future war in which our country might in the future become involved.

The report goes into considerable detail regarding co-ordinating measures which may be applied, and discusses such matters as priority, classification ratings, allocations, licenses, embargoes, permits and warrants, control of prices, control of foreign trade, and organization of government corporations.

TREASURY ASKS BIDS ON MANGANESE ORE

Bids for a large quantity of manganese ore will be received Oct. 19 by the procurement division of the treasury department, to be purchased in accordance with the strategic materials act, passed during the last session of congress. Bids are on various types of ore.

Bidders have been asked to submit prices on deliveries at Baltimore ports; also for prices on varying quantities (from 5000 to 40,000 long tons) at each delivery point. Total amount to be purchased cannot be determined until the division has been able to ascertain what quanties can be secured at each delivery point at the most advantageous price.

Manganese offered must be from new importations or from domestic mines, not from stocks now in warehouses, thus assuring a net addition to the nation's available supply.

Advertisements for purchase of other essentials to "the needs of industry for manufacture of supplies for armed forces and the civilian population in time of national emergency," are to follow as quickly as specifications and required quantities are determined by a board set up under the strategic materials act.

Materials acquired under this act, except for rotation to prevent deterioration, shall be used only upon order of the President in time of war, or when he shall find a national emergency exists with respect to national defense as a consequence of the threat of war.

A board consisting of the secre-

taries of war, navy and the interior, acting jointly through the agency of the army and navy munitions board, is authorized by law to determine which materials are strategic and critical. Secretaries of state, treasury and commerce will aid the board.

RAILROADS SEEK LOANS FOR EQUIPMENT PURCHASES

Jesse H. Jones, federal loan administrator, stated last week that 15 or 20 railroads have arranged within the past two months to borrow $125,000,000 for equipment purchases. Of that amount RFC would lend the roads about $25,000,000.

Railroad officials have also been discussing with RFC, Mr. Jones said, plans for spending between $50,000,000 and $75,000,000 for equipment repair. He estimated this would rehabilitate all rolling stock of major roads needing repair. United States' railways, he feels, are alive to the present emergency, can handle a 50 per cent increase in traffic by repairing equipment, and can repair their equipment faster than any likely increase in traffic demand.

Freight Car Orders Exceed 46,000

Following a special meeting here last week of member lines, Association of American Railroads, it was announced new freight cars placed in service or ordered by American railroads in 1939 will exceed 46,000. This includes approximately 25,000 additional new cars whose purchase is planned, and 21,260 new freight cars already ordered or placed in service during the first nine months of 1939.

In addition to purchase of new equipment, all railroads are undertaking to repair immediately cars and engines which have not been needed to handle current business but which may be required for increased business in prospect.

Discussing the railroad situation the Association states:

"There will be adequate railroad transportation in the United States for any increased business now in prospect. To provide for such increase, railroads are agreed upon a policy of repairing cars and engines which have not been needed to handle current business. In addition, as traffic and earnings may justify it, additional equipment will be ready to meet demands which may develop."

MORGENTHAU DEVELOPS PLAN TO EXPEDITE DEFENSE

Execution of the national defense program will be expedited through adoption of a formula developed by Secretary Morgenthau to facilitate operations under army or navy contracts which are subject to the Vinson-Trammell act. According to the act, contractors' profits on naval vessels are limited to 10 per cent, on military and naval aircraft to 12 per cent of the contract price. Bureau of internal revenue enforces the limitation.

Secretary Morgenthau has expressed to the secretary of war and the acting secretary of the navy, his willingness to negotiate closing agreements, authorized by section 3760, internal revenue code, with contractors who must enlarge facilities to meet army or navy needs. These closing agreements, binding on both treasury and contractor, would set forth, in advance of contract completion, the manner in which the bureau of internal revenue is to treat the cost of special facilities in computation of the contractor's profits under the Vinson-Trammell act. Normally, in absence of closing agreement procedure, cost of new facilities may be amortized by depreciation or obsolescence allowances determinable only upon completion of the contract.

The army or navy will certify to the treasury its opinion concerning the proper percentage of cost to be allowed as a deduction. When such certification shows installation of special facilities is necessary for the national defense program and that, due to technical considerations, such facilities will be partially or totally useless after completion of the contract, the treasury, at the time the contract is signed, will agree on the basis of the facts in each particular case to allow a fixed percentage of reasonable cost to be charged when the profits are computed under the Vinson-Trammell act.

MANUFACTURERS' GROUP DEFINES STAND FOR PEACE

American industry's position on peace and war was defined last week in a statement of the National Association of Manufacturers, issued by its president, Howard Coonley:

American industry hates war.

War destroys lives, wrecks homes. Economic chaos, years of crushing depression are its inevitable aftermath. It imperils representative democracy. Ultimately no one can escape the ruin of war.

American industry wants peace. Peace is the life blood of progress, must be the national objective.

The United States can stay out of war.

Emotionalism can betray us into war.

A public will to peace, coupled with wise public policies and affirmative action to this end by our government will keep us out of war.

Europe's problems do affect us, but our domestic problems still must come first.

Manufacturers will not relax their efforts to achieve and maintain sound improvement in our domestic economy.

Industry opposes profiteering. We pledge our energetic support to this policy.

Months ago this association said: "No sensible person believes that profit can come out of the wreckage of human life and economic dislocation."

The present situation calls for agreement on common objectives, but the democratic process of consultation and criticism must never be abandoned.

In a world distraught by force the best way to preserve representative democracy is to practice it.

GOVERNMENT IRON, STEEL PURCHASES TOTAL $2,744,401

During the week ended Sept. 16, the government purchased $2,744,401.68 worth of iron and steel products under the Walsh-Healey act as follows: National Lock Co., Rockford, Ill., $11,315.99; Copperweld Steel Co., Glassport, Pa., $141,350 (estimated); Struthers Wells-Titusville Corp., Titusville Forge division, Titusville, Pa., $12,372.80.

S. Weinstein Supply Co., New York, $10,650; Babcock & Wilcox Tube Co., Beaver Falls, Pa., $73,304.82; National Tube Co., New York, $20,931.37 (estimated); Price Bros. Inc., Frederick, Md., $15,632; Columbia Steel Co., San Francisco, $76,166.00; Midvale Co., Washington, $20,925; Lukens Steel Co., Coatesville, Pa., $44,400 (estimated).

Carnegie-Illinois Steel Corp., Washington, $30,904.20 (estimated); Phoenix Iron Co., Phoenixville, Pa., $100,912.50 (estimated); Jones & Laughlin Steel Corp., Pittsburgh, $111,000 (estimated); Worth Steel Co., Claymont, Del., $154,750 (estimated); Ross Galvanizing Works Inc., Brooklyn, N. Y., $25,014 (estimated).

Lindberg Engineering Co., Chicago, $22,900; American Bridge Co., Denver, $609,360; Koppers Co., Bartlett-Hayward division, Baltimore, $21,000; Golden Gate Iron Works, San Francisco, $11,162; Inland Steel Co., Chicago, $95,040; Bethlehem Steel Co., Bethlehem, Pa., $43,710; Beatrice Steel Co., Sparrow's Point, Md., $44,076 (estimated); Columbian Steel Tank Co., Kansas City, Mo., $415,000 (estimated).

A. N. Eaton Metal Products, Omaha, Nebr., $86,190 (estimated); Stefco Steel Co., Michigan City, Ind., $83,880 (estimated); Perfection Steel Body Co., Galion, O., $169,750; James Mfg. Co., Ft. Atkinson, Wis., $35,175 (estimated); and Martin Steel Products Corp., Mansfield, O., $257,530 (estimated).

AVIATION

ADVANCE IN PRODUCTION BRINGS PLANT EXPANSIONS

■ LARGE-SCALE plant expansion programs soon will be launched by additional aircraft builders to facilitate their industry's scheduled production acceleration.

North American Aviation Inc. has plans for expanding its Inglewood, Calif., plant by 50 per cent, according to company spokesmen. In addition to a new assembly unit, North American will build a die foundry and drop hammer shop. Total cost may reach $1,000,000.

Now taking shape are factory extension projects by Vultee Aircraft division of Aviation Mfg. Corp., Downey, Calif.; Consolidated Aircraft Corp., San Diego; and Aero Supply Mfg. Co., Corry, Pa. Curtiss-Wright Corp. last week awarded general contract for a 115 x 160-foot plant to cost over $75,000, at Tonawanda, N. Y.

Douglas Aircraft Co. Inc. has entered into a consent decree with national labor relations board in which it agrees to withhold further recognition of the independent Aircraft Workers' Union Inc. This closes a case pending since the March, 1937, sitdown strike in Douglas' Santa Monica, Calif., plant. Company also is to award back pay to 12 workers covering a period between an offer of reinstatement following the strike and the time when they actually returned to work.

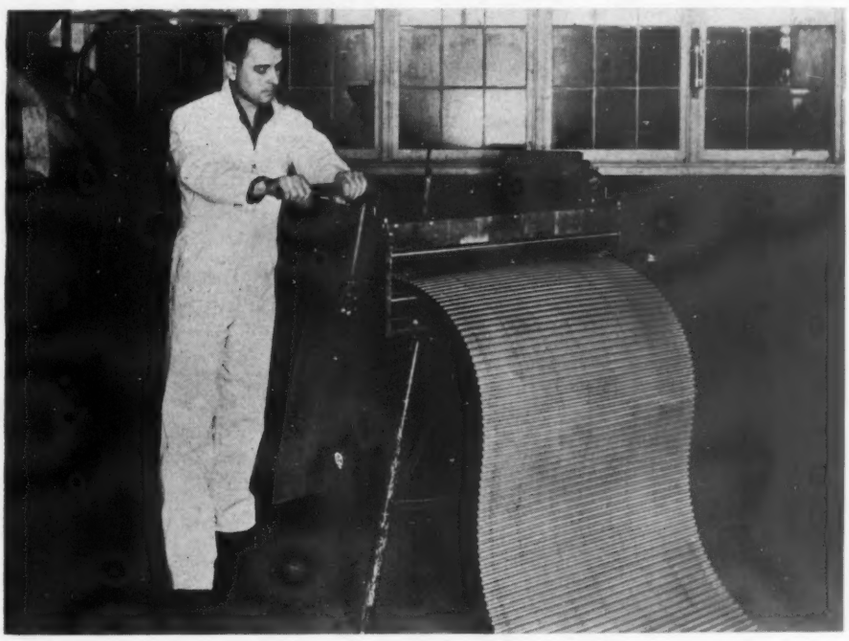
Government orders placed last week: For the army air corps, Seversky Aircraft Corp., Farmingdale, N. Y., interceptor pursuit planes, $3,478,000; and Bell Aircraft Corp., Buffalo, interceptor pursuits, $2,839,000; and for the navy, Vought-Sikorsky division of United Aircraft Corp., East Hartford, Conn., fighting craft and parts, $1,998,420; and North American Aviation Inc., Inglewood, Calif., planes and parts, $676,400.

Ocean Air Traffic Booming

Curtailment of normal ocean transport and communication facilities growing out of European hostilities has brought transoceanic airlines a flood of business. Despite stepped up schedules, Pan American Airways is booked well ahead for passengers, mail and express over its Atlantic and Pacific routes. Germany's suspension of its Lufthansa system in South America has left that continent almost entirely dependent on Pan American service. Foreign airlines formerly operated South American routes as follows: German, 23,750 miles; American, 21,300; French, 3400; Italian, 1900; and Dutch, 1750.

A new line of spot welders and other equipment for aircraft welding of stainless steel and aluminum alloys has been developed by Acme Electric Welder Co., Huntington Park, Calif.

Corrugating Roller Developed by Airline



■ **Engineers at United Airlines' Cheyenne, Wyo., repair base designed and built this hand-operated 36-inch steel corrugating roller. Principal use is in corrugating sheetmetal for transport plane landing wheel nacelles. In its Cheyenne shops United also manufactures heating boilers, cowlings, fuel tanks, oil radiators, exhaust collectors and special servicing stands**

MEETINGS

TOOL DEALERS ANNOUNCE CONVENTION IN CLEVELAND

■ ASSOCIATED Machine Tool Dealers of America will conduct its annual convention at Hotel Cleveland, Cleveland, Oct. 5. The group originally planned to sponsor a dinner at the same place on Oct. 9 during the Machine Tool show, but this was called off when the show was canceled.

Program for the meeting includes breakfast for the executive committee, followed by a business session at which committees will report, new officers will be elected, and discussion presented on the possible effect of government buying on the machine tool industry. An informal dinner is to be served in the evening with J. R. Weaver, director of equipment purchases, inspection and tests, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and president, American Society of Tool Engineers, speaking on "Machine Tool Problems."

On Oct. 6-7 members of the Dealers' association will attend sessions and plant visitations of the American Society of Tool Engineers conducting its semiannual meeting at the Statler hotel.

JOINT MEETING ON FUELS TO BE HELD IN COLUMBUS

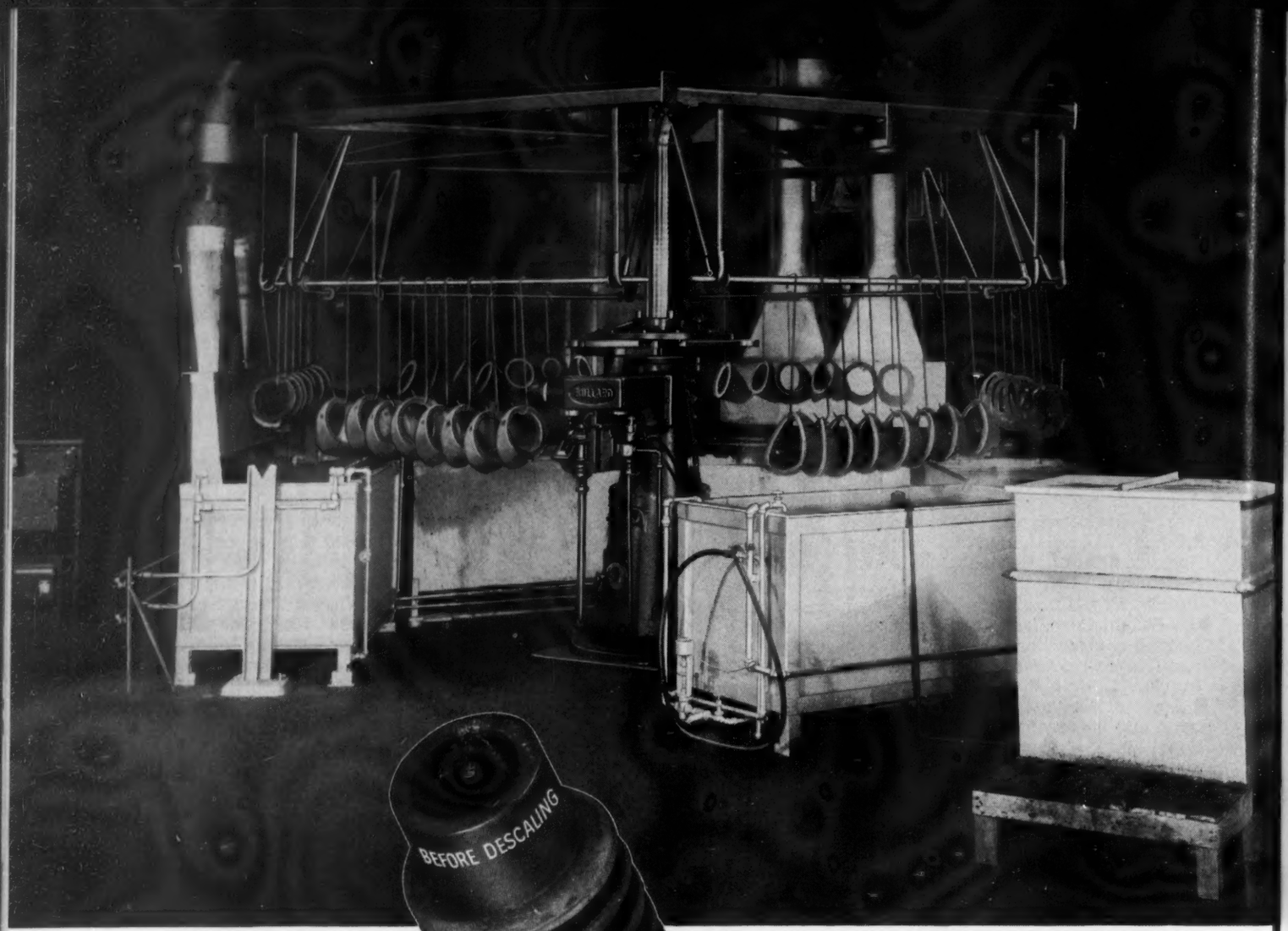
A joint meeting of the coal division, American Institute of Mining and Metallurgical Engineers, and fuels division, American Society of Mechanical Engineers, will be held in Columbus, O., Oct. 5-6. Similar meetings were conducted last fall in Chicago and the previous year in Pittsburgh with attendances of over 300.

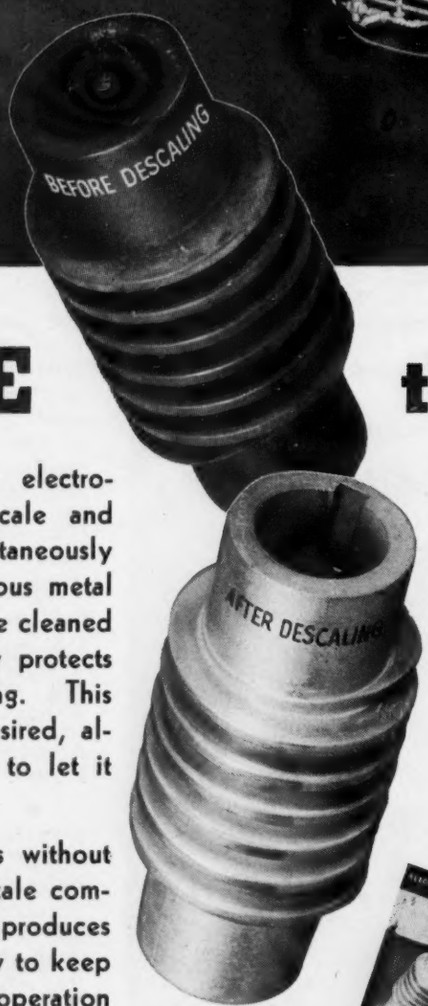
GAS ASSOCIATION TO CONVENE IN NEW YORK

American Gas association will hold its twenty-first annual convention at Hotel Pennsylvania, New York, Oct. 9-12. Alexander Forward, 420 Lexington avenue, New York, is managing director.

ARRANGING PROGRAM FOR PORCELAIN ENAMEL FORUM

Porcelain Enamel institute has prepared a tentative program for its fourth annual forum at Ohio State university, Columbus, O., Oct. 18-20. A symposium on fine-ground enamels will feature a session afternoon of Oct. 18. Cast iron and sheet iron and hollow ware sessions will be conducted morning of Oct. 19; in the afternoon the same two groups will reassemble, while a third will discuss architectural enameling. General sessions morning and afternoon Oct. 20 will be devoted to shop men's problems.





DESCALE this modern way

The Bullard-Dunn Process is an electro-chemical method of removing scale and oxide from ferrous metals. Simultaneously with the scale removal, a continuous metal film, usually tin, is deposited on the cleaned areas. This metal film completely protects the work from pitting and etching. This film can be removed easily, if desired, although it is usually advantageous to let it remain.

The Bullard-Dunn Process descales without dimensional change. It removes scale completely even from recesses. It produces chemically clean surfaces. It is easy to keep in continuous operation. Cost of operation is low.

Bullard-Dunn Process installations can be either manually operated or conveyorized. Note the Bullard-Dunn Station Type Conveyor illustrated above.

Write to The Bullard Company, Bridgeport, Connecticut, for the booklet giving more information about this unusual method of scale removal.

CHECK THESE FEATURES

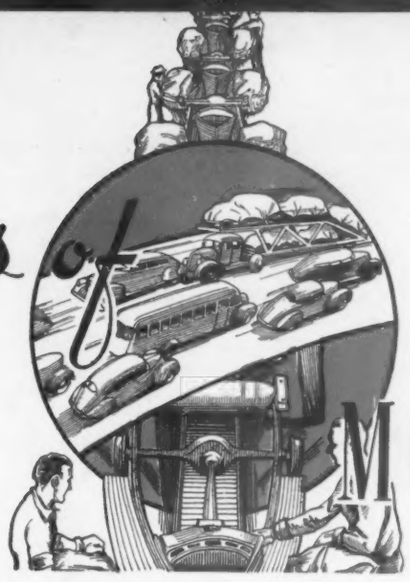
Rapid and economical
Easy to operate
No dimensional changes
No etching
Descales recesses
Produces chemically clean surfaces
Savings in grinding time
Long solution life
Rust protection of parts after descaling

BULLARD-DUNN PROCESS

THE BULLARD-DUNN DIVISION of THE BULLARD COMPANY

BRIDGEPORT • CONNECTICUT

Mirrors of MOTORDOM



By A. H. ALLEN
Detroit Editor, STEEL

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DETROIT

■ "FIRST great martial triumph for the internal combustion engine" is how one military observer and commentator sums up Hitler's *blitzkrieg* against Poland. S. L. A. Marshall, student of military tactics and one of the ablest analysts of present hostilities, writing in the *Detroit News*, elaborates by pointing out that "the airplane overhead, the tank and the armored car for employment against cities and prepared positions, artillery mounted on tractors, antiaircraft guns mounted on trucks, supply trains carrying their own gasoline, advance parties and patrols moving out on motorcycles, sabotage and sniping details dropped from airplanes behind the enemy's line and on his communications—these are the things that open up the way for Hitler's thunderbolt triumph.

"When you think about it that way, it does not seem very far from Detroit to Warsaw and Lwow. An idea that got started here and took a wrong left-hand turn shortly after the World war was the basis of the first 'lightning war.'

Born of Versailles

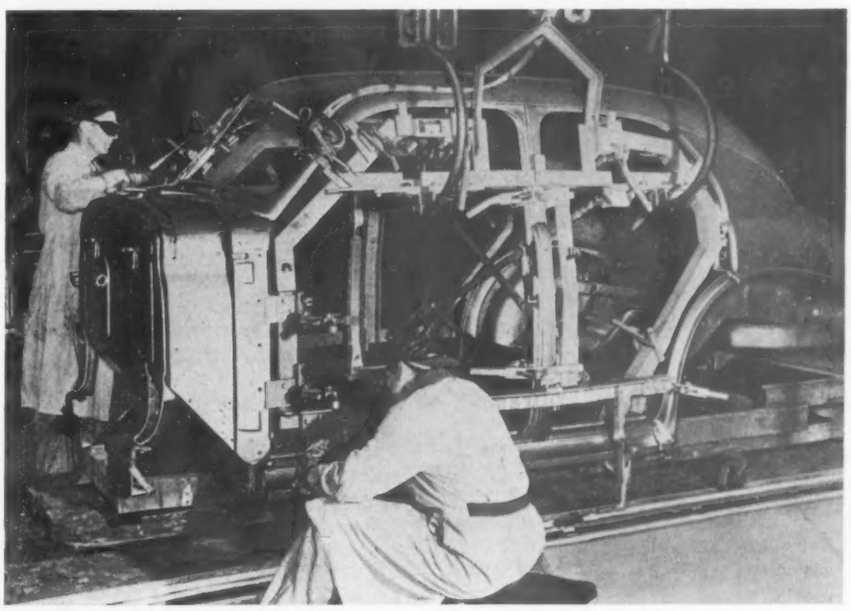
"The Polish war was just such a blow as the German army has dreamed of delivering for the last 15 years. . . The lightning war idea was another of the illegitimate children of the Versailles treaty, which limited the German army to 100,000 men. Out of necessity the theory was developed of lightning-swift attack with masses of tanks, armored cars and highly mobile artillery, accompanied by clouds of airplanes. Every soldier would be a specialist technician. Germany would win wars without infantry.

"The latter assumption was wholly fallacious, and was automatically dropped when Germany re-established universal conscription. But after the masses were made available to the army, the plan retained its integrity, and the drafts were accommodated to its general outline. The armored car (Panzer) divisions were steadily strengthened, in material and increased in number.

"What was outstanding in the two weeks during which the German army invaded Poland is that—so far as we know—a comparatively small number of pitched battles occurred, and the German columns, almost unscathed, penetrated deep into Poland at a number of points. The relative lightness of German casualties is also suggestive. The inference is that the masses found relatively little employment, and that mobility was the decisive factor in assessing the result."

To this center of development of the internal combustion engine in America, these were highly interesting details. What is lacking, however, is information on how the German mobile units stood up under what retaliation the Poles were able to offer, how many of the waves of hundreds of high-speed tanks stalled under pressure of the drive, how many German welds opened up in the face of answering gunfire, how German *ersatz* rubber tires with-

Assembling Bodies for New Buick Series



■ **Three major subassemblies are welded together to form the new bodies developed by Fisher Body and Buick engineers for the two new series of Buicks introduced last week. Perfect alignment is assured by jigs in the door openings and removable cross braces which resist expansion and contraction of the steel during welding**

stood the pounding of rough terrain, how German engines behaved when "given the gun" with gasoline-alcohol mixtures in fuel tanks. These details likely never will be known, even if they were observed, because of rigid censorship of everything emanating from Europe these days.

■ IF YOU do not know by this time that the 1940 Buicks are on the market then you are immune to the impact of newspaper, magazine and radio onslaughts, for last week Buick unleashed one of the most intensive merchandising drives in its history, using all available means of contact with prospective buyers.

External features of the six new lines of cars are readily apparent upon inspection; not so apparent are the 70 or more changes engineers have made in engine and chassis details. Summary of a few reveals the pains taken each year to develop improvements.

Take the new body structure for the 50 and 70 series, illustrated herewith, which is virtually a double-walled construction, the usual outer steel panels being reinforced with additional inner panels which serve not only as a solid bracing but as added protection for passengers. Panel bracing of this type replaces the usual channel section bracer. Even the large holes required in the inside panels of doors, through which to install door, lock and window controls, have reinforcing plates installed over them.

Heavy Box Section Members

Another feature is the use of box section members in the body frame wherever possible, one of the main members being a heavy box section rail beginning at the bottom of the cowl on each side—extending up the cowl sides, through the windshield post to the roof, then along the roof to the rear of the body and down to the frame of the wheelhouse at the rear.

The rocker panel—extending along the bottom of the body on each side from the front pillars to the wheelhouse—is a heavy triangular box section member, connected to the panel on the opposite side by six steel channel section cross bars. Box section members also tie together the ends of the rocker panels and also the two rear wheel housings. Cowl is braced with both diagonal box section and horizontal channel section braces in place of the one horizontal brace usually used. Small wonder these bodies are about 125 pounds heavier than comparable styles.

Center body post comprises three U-shaped channel sections, welded together to form a reinforced box section post on which to hang rear doors. Innovation in body mounting also is presented, involving two rows of bolts on each side, one directly to the frame side rail, and the other through the rocker panel to brackets extending out from the frame. Rubber, of course, is used in conjunction with these bolts where body and frame would come in contact.

Take rear coil springs, which now have larger inside diameter (5½ inches) and are shorter, being installed 3 inches closer to the centerline of the axle and above the axle. Torque tubes and propeller shafts are long, single units, rather than the divided type previously used.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1937	1938	1939
Jan.	399,186	226,952	356,950
Feb.	383,900	202,597	317,517
March	519,022	238,447	389,489
April	553,231	237,929	354,263
May	540,377	210,174	313,214
June	521,153	189,402	324,235
July	456,909	150,450	218,478
7 mos.	3,373,778	1,455,951	2,274,146
Aug.	405,072	96,946	*99,000
Sept.	175,630	89,623	.....
Oct.	337,979	215,286	.....
Nov.	376,629	390,405	.....
Dec.	347,349	406,960	.....
Year	5,016,437	2,655,171	.....

*Estimated.

Estimated by *Ward's Reports*

Week ended:	1939	1938†
Aug. 26	18,365	18,700
Sept. 2	25,240	22,165
Sept. 9	26,865	17,485
Sept. 16	41,245	16,100
Sept. 23	53,950	20,390

†Comparable week.

	Week Ended	
	Sept. 23	Sept. 16
General Motors	16,900	10,825
Chrysler	21,100	17,925
Ford	1,950	1,600
All others	14,000	10,895

This places the universal joint and torque ball directly back of the transmission. The 27-inch longer torque tube provides more leverage against road bumps and less upward force of the torque tube on the torque ball. The tube is now bolted at the rear to the differential carrier. To eliminate scoring of the malleable iron torque ball against the stamped steel inner and outer retainers, the ball is tin plated.

Rear shock absorbers have been moved from the frame to the brake backing plates where they can exert maximum control of axle movement. They are cast iron parallel cylinder units. A light stabilizer bar has been added to the rear suspension system to balance the action of the front stabilizer bar.

An innovation aimed toward quietness is the use of a section of flexible hose in the copper fuel tank to fuel pump line, dampening any sound emanating from the pump and preventing it from being telegraphed to the frame. The hose is of Neoprene synthetic rubber wound with piano wire and covered with canvas.

Mufflers are now of terne plate (lead coated) in the attempt to overcome exorbitant toll which road salt has been exacting from unprotected sheet steel mufflers.

Full-length side pans of stamped steel have been adopted to protect engine compartments from ice and mud.

Automatic choke "stove" has been redesigned to provide a shorter warm-up period by the use of an Inconel tube built through the exhaust manifold at the exhaust manifold valve inlet, directly in the flame path and heating immediately because of less mass.

By use of a sealing-type radiator filler cap, with suitable valving arrangements, a pressure of 7 pounds is maintained in the cooling system, raising the boiling point of the cooling solution about 20 degrees. More uniform engine cooling is claimed to result, as well as less likelihood of a boiling radiator in high altitudes or high temperatures.

■ MENTION of a "lignin plastic" produced by a Wisconsin paper mill in this department for Aug. 7 elicited a number of inquiries for further information on this product. Guy C. Howard, associated with the Marathon Chemical Co., division of the Marathon Paper Mills Co., Rothschild, Wis., has been kind enough to supply STEEL further information on lignin plastics this company is offering.

These plastics represent one result of several years' research into methods for disposal and utilization of waste sulphite liquor which is the liquor containing the lignin and semicellulose constituents of wood dissolved in the pulping process. Objectives have been both to reduce stream pollution incident to discharge of these liquors into waterways and to supplement the value of cellulose pulp by realizing the commercial potentialities of the large tonnage of noncellulose organic matter going to waste in such liquor.

The main process by which the liquor is processed into primary products is a three-stage lime precipitation treatment, which yields inorganic and organic solid products capable of further use and a final waste liquor of improved stream pollution characteristics.

The plastic materials are produced

(*Please turn to Page* 164)

"40% FASTER-20% EASIER"

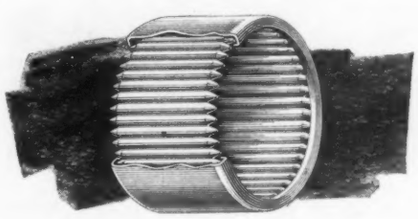
WITH THE TORRINGTON NEEDLE BEARING

The Whitney-Jensen combination bending brake in use. Torrington Needle Bearings have increased the ease and speed of operation.

TORRINGTON Needle Bearings are standard equipment now on all Whitney-Jensen combination bending brakes—because experience has proved that their operation is far faster and easier when Needle Bearings are used.

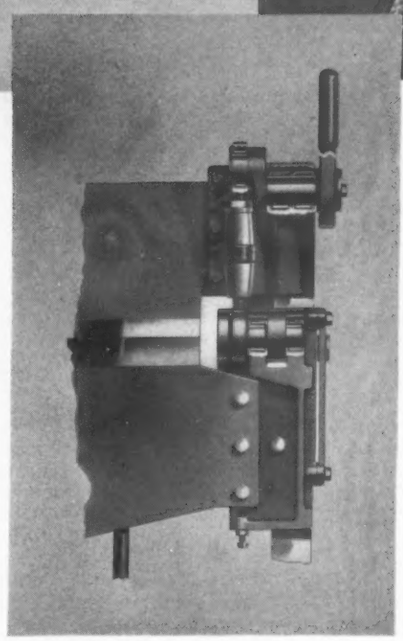
Whitney Metal Tool Company, manufacturer of the brakes, tested the Needle Bearing in comparison with bushings on apron supports and eccentric shafts. Here's what their engineers report:

"The force necessary to swing the apron when making a bend was decreased by 12 to 14%. The force required to pull down the upper jaw when pressing seams to flatten them out after



bending was decreased by 32%, and the force necessary to release the clamping handle from the over-center position was decreased by 90%."

Whitney customers were quick to appreciate the advantages of the Needle Bearing. One customer reports that his production has been doubled by the Needle-Bearing-equipped brakes. Other users of bushing-equipped brakes have had Needle Bearings installed at their own expense—in order to gain these advantages of improved operation. "In general," says the Whitney Metal Tool Company, "the Needle Bearing brake is 40% faster than the same brake equipped with plain bearings and is 20% easier on the operator."



View showing the location of the Torrington Needle Bearings on the bending brake. Note the simplicity of housing design.

Translate these remarkable operating improvements into terms of your own products. Consider that the Needle Bearing gives you anti-friction operation, with high load capacity, in a low-cost, compact unit that is easily installed, and frequently occupies no more space than a plain bushing. Let the Torrington Engineering Department show you how easily your product designs can be adapted to incorporate the advantages of this unusual bearing.

For further information write for Catalog No. 10. For Needle Bearings to be used in heavier service, request Booklet No. 103X from our associate, Bantam Bearings Corporation, South Bend, Ind.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

Makers of Ball and Needle Bearings

Branch Offices in all Principal Cities

TORRINGTON
NEEDLE BEARING

MEN OF INDUSTRY

■ H. V. LAUER has been appointed superintendent, Joliet, Ill., coke plant, Carnegie-Illinois Steel Corp., Chicago. Formerly assistant superintendent of the company's Gary, Ind., coke plant, Mr. Lauer had previously been with Union Carbide Co., New York; General Refractories Co., Philadelphia; Wisconsin Steel Co., Chicago.

♦

C. A. Criqui Sr., founder, 33 years president, Sterling Engine Co., Buffalo, has given over active administration of the company to S. H. Logan, newly elected president, and A. F. Vars, who fills the recently created post of executive vice president. Mr. Criqui will serve as chairman of the board.

♦

Dana J. Fox has been appointed assistant treasurer, National Supply Co., Grant building, Pittsburgh. Formerly associated with Fretz-Moon Tube Co., Butler, Pa., Mr. Fox served as vice president-treasurer and a director of the latter company four years.

♦

F. H. Blackburn, employes' investment trust fund manager, General Electric Co., Schenectady, N. Y., plans to retire soon, after more than 40 years' service. He will be succeeded by Ralph Beman, for many years an associate.

♦

G. T. Horton has been elected president, American Welding society, will be inducted, with other officers for 1939-1940, during organization's annual October meeting. Vice presidents elected: T. C. Smith, first; L. S. Moisseiff, second; W. F. Hess, New York, New England district; L. C. Bibber, middle eastern; K. L. Hansen, middle western; A. J. Moses, southern; L. W. Delhi, Pacific coast. E. V. David, J. D. Gordon, G. F. Jenks, H. S. Smith, will be installed directors at large.

♦

Lee C. Carlton has been appointed manager of the newly created sales and engineering service division, American Bosch Corp., Springfield, Mass. Formerly Bosch's western division sales manager, Mr. Carlton is succeeded by Foster N. Perry. Frank Oberle was named eastern division sales manager, and Maynard A. Fowler, sales manager, Pacific coast division.

♦

Henry B. du Pont has been elected vice president and executive committee member, E. I. du Pont de Nemours Co., Wilmington, Del. Formerly a member board of directors, and assistant to the president, Mr. du Pont is a graduate of Yale university and Massachusetts Institute of Technology.

H. V. Lauer

♦

A. J. Roche has been appointed Detroit warehouse manager for Pittsburgh Plate Glass Co., Pittsburgh, effective Oct. 1. P. A. Ketchum will became manager of the company's Toledo, O., warehouse, succeeding Mr. Roche. Other Pittsburgh Plate Glass warehouse personnel appointments: F. T. Hughes Jr., Columbus, O., manager; R. M. Claflin, Mobile, Ala., manager; G. F. Parker Jr., Buffalo, assistant manager; G. E. Percy, Montgomery, Ala., manager.

♦

Edmond P. Severns has been elected vice president in charge of sales, Continental Steel Corp., Kokomo, Ind. Formerly sheet sales general manager, Mr. Severns has been engaged in the steel industry for 17 years, starting with Chapman-Price Steel Co., Indianapolis, as assistant to sales manager.

Edmond P. Severns

♦

W. V. Merrihue has been named assistant to publicity department manager, General Electric Co., Schenectady, N. Y., and will head news bureau's apparatus division. R. L. Gibson was named general publicity division head, B. J. Rowan administrative, production division publicity director.

♦

Dr. Frank O. Clements, technical director, General Motors research laboratories, Detroit, was given a farewell dinner Thursday, Sept. 21, by his associates, including Charles F. Kettering, vice president in charge of research. Dr. Clements plans to return to his birthplace, Westerville, O., following his retirement, Oct. 1.

♦

Lieut. Col. G. M. Carrie has been elected president, Canadian Refractories Ltd., Montreal, Que. N. P. Pitt was named managing director. G. S. Kilbourn, who retires as president, has been elected chairman, board of directors.

♦

P. E. Tobin, long associated with Jessop Steel Co., Washington, Pa., as special representative, has been appointed Chicago branch district manager. E. E. Gregory has been named Chicago branch office manager.

♦

John C. Gearhardt has been appointed tool steel sales manager for Detroit district, Allegheny Ludlum Steel Corp., Brackenridge, Pa.

♦

Edward P. Wells has been appointed vice president, general sales manager, Eureka Vacuum Cleaner Co., Detroit.

♦

Pierce J. McAuliffe, 254 West Thirty First street, New York, has been appointed New York representative for Baldwin Machine Works, Baldwinsville, N. Y. He first joined the company in 1910, has been continuously associated with it since 1920. He will be in charge of hydraulic dredge, steam engine, Morris centrifugal pump sales.

♦

James D. Clokey Jr. has been selected manager, Cleveland district office, Superior Steel Corp., Pittsburgh, with offices in the Union Commerce building, effective as of Sept. 11.

♦

M. L. Erlenmeyer, Elmira, N. Y., has been appointed T. B. Wood's Sons Co., Chambersburg, Pa., distributor for the company's power transmission machinery, in and around Elmira.

♦

L. H. Frost, has been made Detroit district manager for Thomson-

Gibb Electric Welding Co., Lynn, Mass. He formerly was associated with Electric Controller & Mfg. Co., Cleveland.

♦

Howard Burk, for 20 years head, Chicago Screw Products division, Scovill Mfg. Co., Waterbury, Conn., has become affiliated with General Screw Mfg. Co., Chicago.

♦

William Tourville has been named general superintendent, Detroit Steel Castings Co., Detroit, succeeding the late E. W. Pike. Mr. Tourville was formerly maintenance superintendent.

♦

Len Redford, buyer for Pontiac Motors division, General Motors Corp., Pontiac, Mich., has been named assistant to F. J. McLaughlin, general purchasing agent. Charles Korneffell succeeds Mr. Redfern.

♦

N. C. Patterson has been named plant engineer, Dodge main division, Chrysler Corp., Detroit, succeeding H. S. Wells, now staff plant engineer.

♦

W. O. Leonard is now directing operations at Wilson Foundry & Machine Co., Pontiac, Mich. Mike Rutzen succeeds Omer L. Allen as foundry superintendent.

DIED:

■ GEORGE W. PICKERING, 46, assistant sales manager, Cleveland Tractor Co., Cleveland, at his home in Cleveland Heights, O., Sept. 16. Mr. Pickering had been associated with the company for 20 years.

♦

William S. Gregg, 65, Newark, Del., advisory director, legal department of E. I. du Pont de Nemours Co., Wilmington, Del., in Newark, Sept. 14.

♦

Col. Joseph A. Robertson, 89, formerly adviser to the Mexican government, organizer of several northern Mexican industries, including Monterey Foundry & Machine Co., and Monterey Wire Nail Co., Monterey, at his home in San Antonio, Tex., Sept. 15.

♦

John Franklin Miller, 80, former president, Westinghouse Air Brake Co., Wilmerding, Pa., at his home in Goshen, N. Y., Sept. 17. A graduate and trustee of Wooster college, Wooster, O., Mr. Miller had been associated with Westinghouse interests 51 years.

♦

M. Frank Wilson, 62, general superintendent, Cleveland File Co., Cleveland, until ill health forced his resignation in 1934, at his home in Cleveland, Sept. 15. A native of Norway, Mr. Wilson spent many years in the file and saw industry.

♦

Robert Swett, 51, superintendent, Brightwood branch, Moore Drop Forging Co., Springfield, Mass., at Bennington, Vt.

♦

Herold Hutchings, 41, junior partner, Irwin & Hutchings Co., Detroit, in Detroit recently.

♦

Eugene Noble Foss, 80, former president, B. F. Sturtevant Co., Boston, blowers and engines manufacturer, in Boston.

♦

J. H. Petree, president, Perfection Bed Spring Co., Mansfield, O., at his home in Mansfield.

♦

Ludwig Kemper, 63, former secretary and treasurer, Midland Steel Products Co., Cleveland, in Cincinnati, Sept. 19.

♦

Harry L. Kopperud, 49, secretary-treasurer, Andrew Kopperud Co., machine manufacturer, Milwaukee, in Milwaukee Sept. 19.

♦

John H. McDonald, 80, until his retirement blast furnace superintendent, Illinois Steel Co., Chicago, at his home in Milwaukee, Sept. 17. Mr. McDonald was associated with steel industry more than 35 years.

♦

John Allen, retired foundry engineer for Cadillac motor foundry, Detroit, member American Foundrymen's association, in Detroit, Sept. 15.

♦

James Meehan Jr., 63, co-organizer, Meehan Boiler & Construction Co., Lowellville, O., at his home in Youngstown, Sept. 10. Though retired from active duty since 1936, due to ill health, Mr. Meehan had remained secretary-treasurer, general manager of the company.

♦

Wilbur J. Merritt, 76, one of the brothers who as timber cruisers discovered first the Vermilion range ore deposits, later the Mesabi range, at his home in Vista, Calif., Sept. 15.

♦

John M. Bright, 98, for many years superintendent, Shenango sheet metal works, New Castle, Pa., at his home in New Castle, Sept. 17.

♦

Chris C. Smith, 78, founder, Chris-Craft Corp., power boat builders, Algonac, Mich., at Mt. Clemens, Mich., Sept. 9.

Student Entries Invited In Bridge Competition

■ Engineering and architectural students throughout the country have been invited by American Institute of Steel Construction to participate in its annual bridge design competition. Cash awards of $200, $100 and $50 will go to prizewinners, while both winning and honorable mention designs will receive merit certificates.

Subject of the competition is a foot bridge to carry pedestrian traffic over a parkway to a recreation area. Approaches may be either ramps, steps or stairs. The bridge is to be an efficient structure of good appearance, but without expensive masonry or decoration. Entire structure, including floor, must be steel.

Competition was announced before start of the academic year so that schools might include the project in their curricula, enabling students to receive credits for working on entries. Drawings must be received not later than Feb. 5, 1940, by the institute at 101 Park avenue, New York. Jury of award will meet Feb. 14.

Scrap Consumption Up 14 Per Cent

■ Domestic consumption of iron and steel scrap in August totaled 2,919,000 gross tons, compared with 2,551,000 tons in July and 1,953,000 tons in August, 1938, according to the Institute of Scrap Iron and Steel Inc., New York. August consumption was 14 per cent higher than July, and 49 per cent over last August.

In the first eight months this year domestic consumption aggregated 19,920,000 tons, 69 per cent more than 11,774,000 tons in the comparable 1938 period.

Export of scrap in the first seven months, 2,139,018 tons, was up 12 per cent over the 1,906,038 tons in the first seven months, 1938.

World Tin Stocks Down

◪ World stocks of tin decreased 4889 gross tons during August, according to figures of the International Tin Research and Development council, released by American Iron and Steel institute. Total stocks at the end of August were 34,608 tons, compared with 39,497 tons at the close of July, and 54,335 tons for August, 1938.

World visible supply fell from 40,121 tons in August last year to 25,015 tons for last month, and smelters' stocks from 14,214 to 9593 tons.

Editorial

Schwab—Exponent of Private Initiative

■ THE DEATH of Charles M. Schwab marks the passing of one of the most vital and engaging personalities the steel industry has known. He contributed greatly, not only to its development, but to its color and tradition. Looking through Schwab as a lens, steel was seen as a business replete with romance and sentiment. Legendary are his spontaneous enthusiasm, his spirit of optimism, his abilities as an organizer, his skill as a public and industrial relations man. As a raconteur few were his equals. For his philanthropy and his willingness to share his fortunes with others he is of blessed memory.

Schwab's greatness was made possible by the era in which he rose to fame. When he entered the steel industry the opportunities for private initiative were as boundless as the horizon, and a man could make of himself what he willed. He could go as far as his imagination, courage and ability would take him. The right to earn a profit was unquestioned. Those individuals who were able to build fortunes as a result of their business acumen and ability were admired and esteemed by the public.

Recently Intensified Restrictions Hamper Industrial Leadership

Schwab was in his fourth year as president of Carnegie Steel Co. Ltd. when the first brake was applied to the free enterprise system. That was the Sherman antitrust law, effective July 2, 1890. There followed the Clayton act in 1914, amendments to the 1894 Wilson tariff act in 1913, the Panama canal act in 1913, the shipping act in 1916, the anti-dumping act in 1916, the packers and stockyards act in 1921, the farm co-operative act in 1922, the grain futures act in 1923 and the perishable agricultural commodities act in 1930.

These restrictions, it will be noted, were applied over a period of 40 years, giving industry a chance to make necessary adjustments in a fairly orderly manner, without severe shock to our economic life. This is in sharp contrast to the tremendous acceleration in business reform legislation during the past seven years. So drastic has been this program that many have regarded it as heralding the deathknell of the free enterprise system that enabled leaders like Schwab to contribute on so notable a scale to our past progress and prosperity.

Schwab's Optimism His Best Legacy To Present Business Leaders

STEEL believes confidently that the repressive wave against business has about run its course and that it is only a matter of time before a better understanding by the public of the nature and the importance of business will be reflected in a public policy of encouraging business, of encouraging success, profits and prosperity.

Under such a condition of enlightenment there again will develop opportunities for gifted leaders like Schwab. We have the resources in raw materials and in brains and machinery for vast expansion along the industrial front. We will need only a national policy that will encourage private initiative.

Perhaps Schwab's unfailing spirit of optimism should be regarded as his principal legacy to those who now guide industry—a spirit of optimism and an enthusiastic determination to make optimistic dreams come true.

The BUSINESS TREND

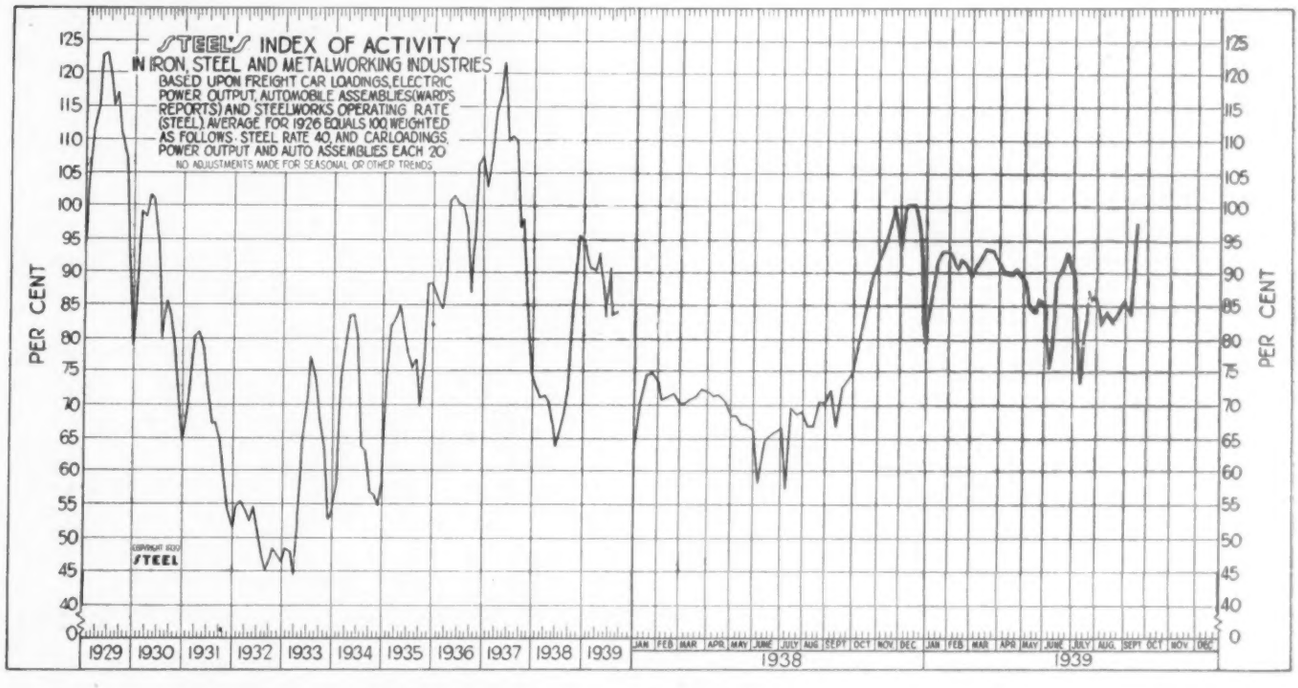
Index Advances to Highest Level Recorded This Year

■ The sharp increase in industrial activity which has been in process since the outbreak of the European war continued with added impetus during the past week, with many industrial barometers touching new highs for the year.

Reflecting this general improvement STEEL'S index for the week ended Sept. 16 not only regained the ground lost during the short holiday week but forged ahead to the highest level recorded since the week ended Dec. 17, 1938. The advance of 13.8 points registered by the index in the latest week represented the sharpest week-to-week increase recorded this year and placed the index at the 97.5 level. At this time last year the index stood at 72.9.

The sharp rise in steelmaking operations since the first of the month has been particularly encouraging and further gains are in prospect as the unusually heavy demand for finished steel products of all kinds shows no signs of abating. Currently the national steel rate is approximately 80 per cent, the highest level since the week ended Sept. 4, 1937. For the week ended Sept. 16, steelworks operations stood at 74 per cent. This represented a gain of 12 points from 62 per cent recorded during the holiday week and also exceeded the 46 per cent registered in the comparable week last year.

A gain in excess of 50 per cent was recorded in automobile production during the week ended Sept. 16. Output in that week climbed to 41,245 units, against 26,865 reported for the week ended Sept. 9, and 16,100 in the comparable 1938 week. A steady increase in automobile


STEEL INDEX OF ACTIVITY
IN IRON, STEEL AND METALWORKING INDUSTRIES
BASED UPON FREIGHT CAR LOADINGS, ELECTRIC POWER OUTPUT, AUTOMOBILE ASSEMBLIES (WARD'S REPORTS) AND STEELWORKS OPERATING RATE (STEEL). AVERAGE FOR 1926 EQUALS 100. WEIGHTED AS FOLLOWS: STEEL RATE 40, AND CARLOADINGS, POWER OUTPUT AND AUTO ASSEMBLIES EACH 20
NO ADJUSTMENTS MADE FOR SEASONAL OR OTHER TRENDS
PER CENT
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939
1938
1939

STEEL'S index of activity advanced 13.8 *points to* 97.5 *in the week ended Sept.* 16:

Week ending	1939	1938
July 1	91.0	66.5
July 8	73.4	57.1
July 15	87.8	69.9
July 22	86.0	68.7
July 29	86.8	69.0
Aug. 5	83.5	66.9
Aug. 12	83.9	66.9
Aug. 19	82.2	70.5
Aug. 26	83.4	70.3
Sept. 2	86.3	72.3
Sept. 9	83.7	66.8
Sept. 16	97.5	72.9

Mo. Data	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	111.2
March	92.6	71.2	114.4	88.7	83.1	78.9	44.5	54.2	80.4	98.6	114.0
April	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7	122.5
May	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2	122.9
June	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8	120.3
July	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9	115.2
Aug.	83.9	68.7	110.0	97.1	76.7	63 0	74.1	45.0	67.4	85.4	116.9
Sept.	....	72.5	96.8	86.7	69.7	56 9	68.0	46.5	64.3	83.7	110.8
Oct.	....	83.6	98.1	94.8	77.0	56.4	63,1	48.4	59.2	78.8	107.1
Nov.	....	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0	92.2
Dec.	....	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3	78.3

production is anticipated through the next 30 days at least, with producers stepping up assembly schedules on 1940 models.

Revenue freight carloadings recorded a more than seasonal increase during the week ended Sept. 16, touching a new high since Oct. 16, 1937. Freight traffic in that week totaled 805,733 cars, a gain of 138,324 over the preceding holiday week and compares with 660,142 cars loaded in the corresponding week last year.

Reflecting the heavy increase in demand for power, due directly to the general upward surge of industrial activity, electric power consumption during the week ended Sept. 16 soared to a new all-time high. Operations in many plants are above the peaks reached in the 1937 boomlet. Power output should continue to set new consumption records during the next two months as the automotive industry is operating far below the level which will be attained within that period.

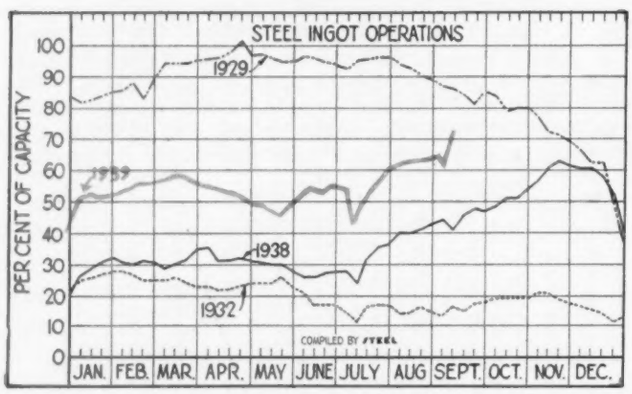
Currently interest is focused on the important neutrality act, the extent of foreign demand resulting from the European war and probable duration of the conflict, all which are vital in gaging the longer trend business prospect.

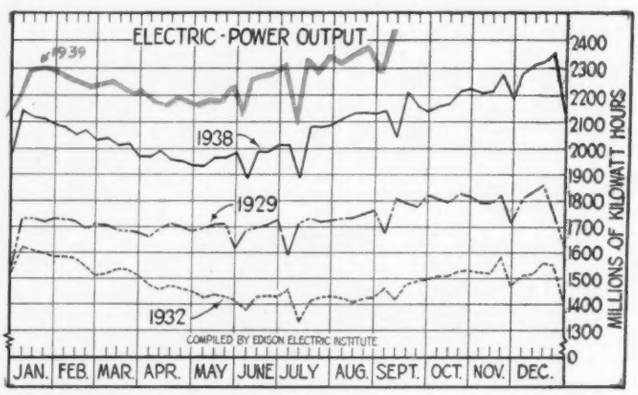
COMMERCIAL FAILURES DECLINE SEASONALLY

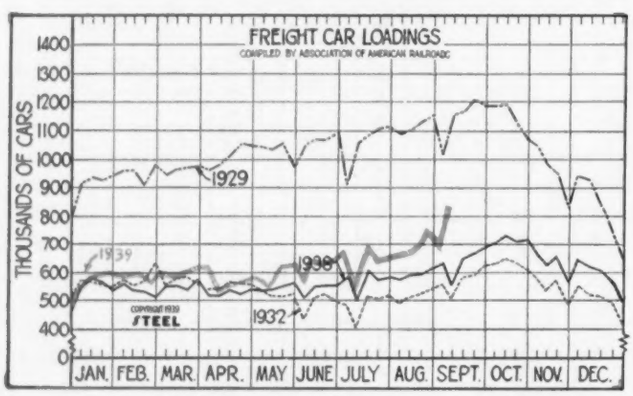
Commercial failures declined seasonally during August to the lowest number for the year to-date and were substantially below the August, 1938, total. Disasters last month aggregated 859 involving liabilities of $11,259,000. This compares with 917 insolvencies involving $14,150,000 liabilities during July. In August last year failures totaled 1015, involving $16,382,000 liabilities. Of the various commercial groups only the commercial service had more failures or greater liabilities last month than in August, 1938. All the others showed substantial reductions.

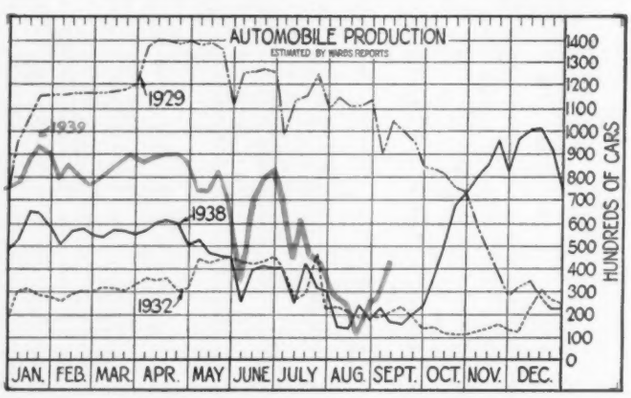
INDUSTRIAL PRODUCTION INCREASES

The Federal Reserve board's seasonally adjusted index rose 1 point during August to 102 per cent of the 1923-25 average, compared with 101 recorded during July. A year ago the index stood at 88. Volume of manufacturing production increased further during August, but mineral production declined, owing to a temporary curtailment in output of crude petroleum. The upward tendency of industrial production during July and August has recorded substantial improvement since the outbreak of war in Europe with many important business barometers touching new highs for the year. Early estimate for September would indicate at least a 9 point rise in the Federal Reserve board's seasonally adjusted index to 110.

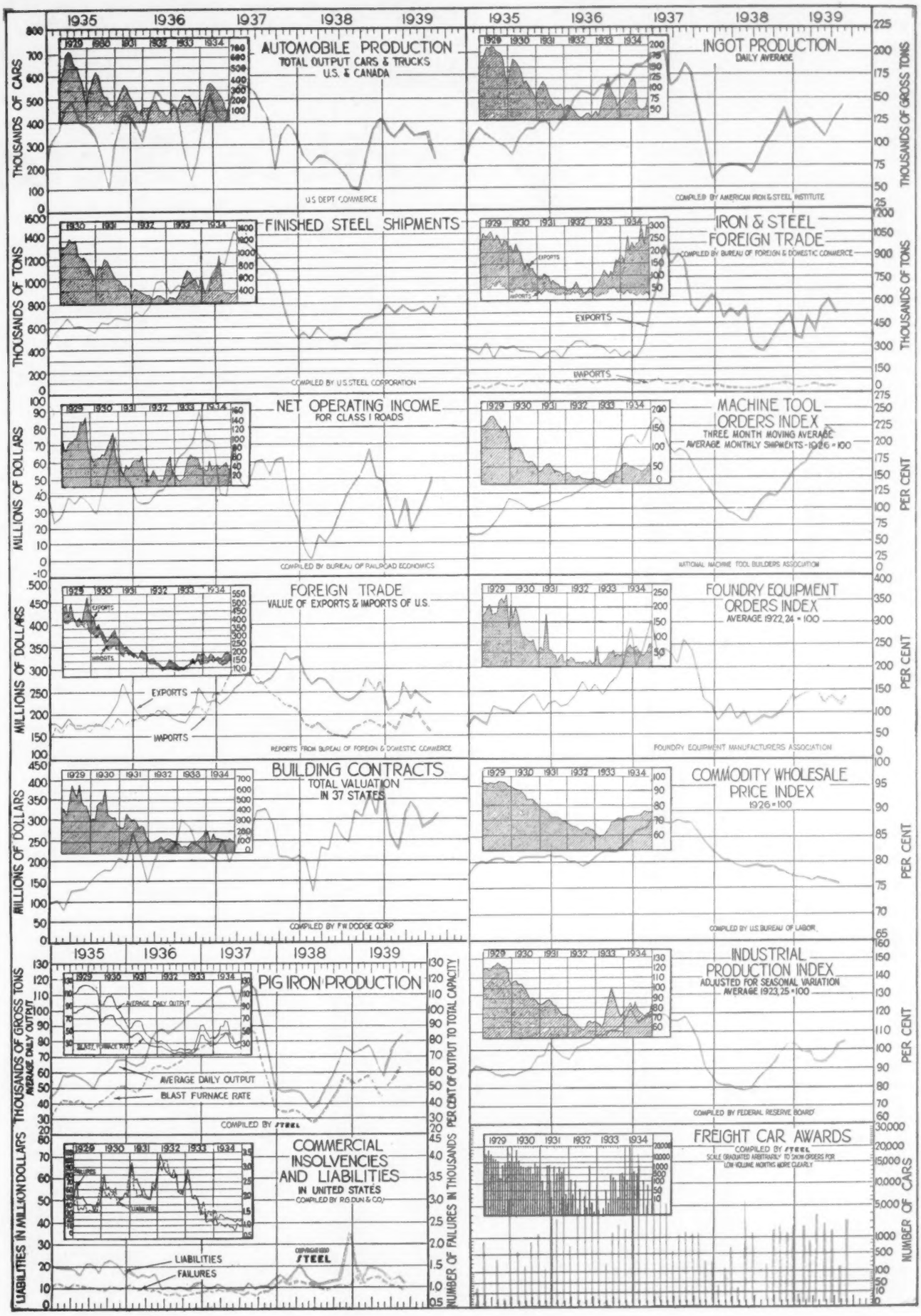


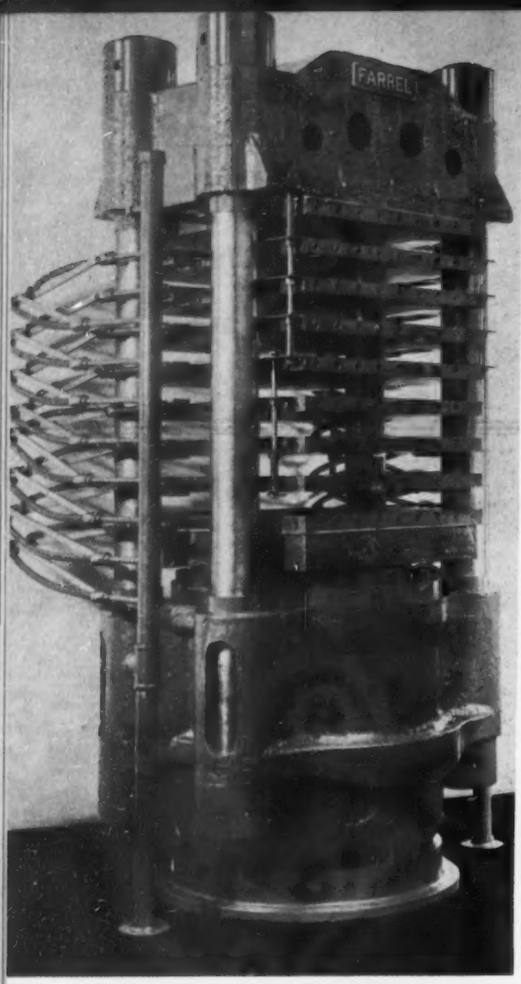


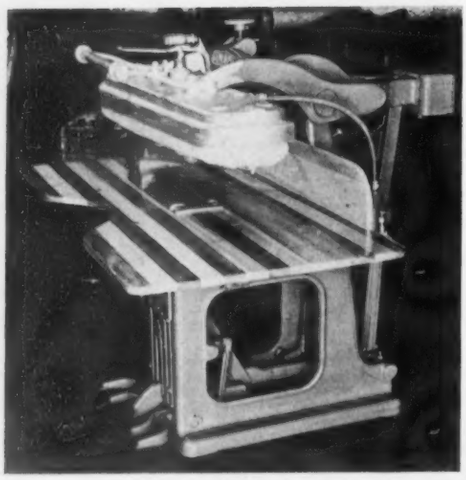


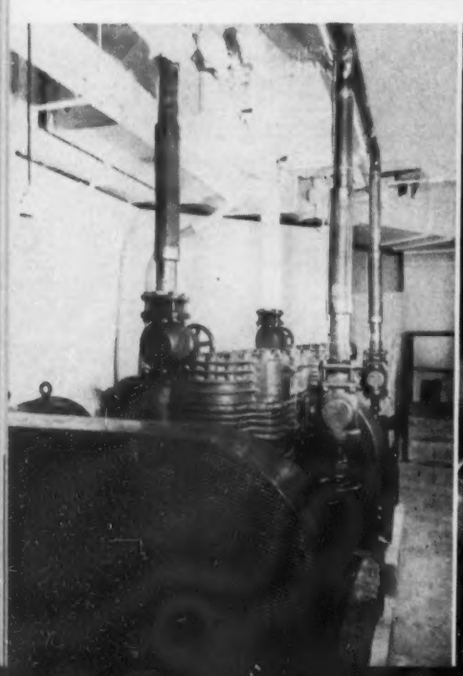


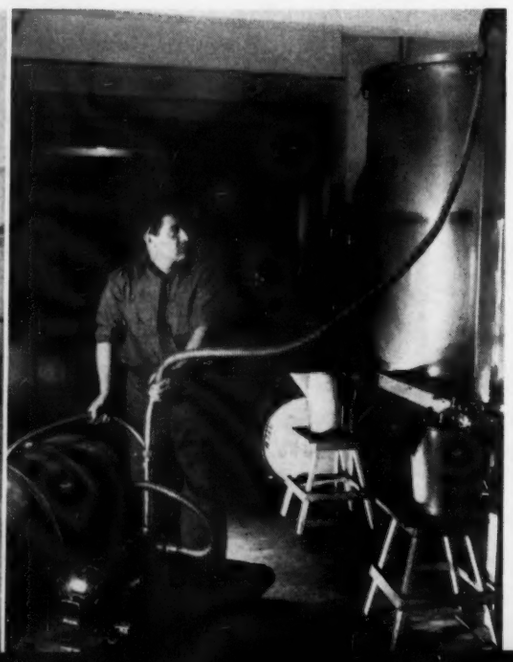
Week ending	Steelworks Operating Rate Per Cent 1939	1938	1932	1929	Electric Power Output Million KWH 1939	1938	1932	Freight Car Loadings Thousands of Cars 1929	1939	1938	1932	1929	Weekly Auto Output 1939	1938	1932	1929
June 10	53.5	25.5	17.0	96.5	2,257	1,992	1,435	1,690	635	554	502	1,055	65,265	40,175	43,491	125,307
June 17	52.5	27.0	17.0	96.0	2,265	1,991	1,441	1,699	638	556	518	1,069	78,305	41,790	44,121	126,125
June 24	54.5	28.0	17.0	94.0	2,285	2,019	1,440	1,723	643	559	499	1,096	81,070	40,918	45,110	125,736
July 1	54.0	28.0	14.5	93.0	2,300	2,015	1,456	1,592	666	559	480	909	70,663	40,945	40,291	98,746
July 8	42.0	24.0	12.0	95.0	2,078	1,881	1,341	1,712	559	501	416	1,065	42,784	25,375	26,560	113,586
July 15	50.5	32.0	15.5	95.5	2,234	2,084	1,415	1,727	674	602	504	1,079	61,610	42,010	29,870	115,075
July 22	56.5	36.0	16.5	96.0	2,295	2,085	1,433	1,723	657	581	502	1,101	47,420	32,070	46,375	123,512
July 29	60.0	37.0	16.5	96.0	2,342	2,094	1,440	1,725	660	589	511	1,104	40,595	30,390	22,461	110,163
Aug. 5	60.0	40.0	14.5	94.0	2,325	2,116	1,426	1,730	661	584	497	1,091	28,250	14,771	23,591	114,364
Aug. 12	62.0	40.0	14.5	93.0	2,333	2,134	1,415	1,733	661	589	512	1,100	24,875	13,790	21,162	111,939
Aug. 19	63.5	41.5	15.5	90.0	2,368	2,139	1,431	1,750	674	598	518	1,136	12,955	23,940	19,568	111,902
Aug. 26	63.5	43.5	14.5	89.0	2,355	2,134	1,436	1,762	689	621	538	1,160	18,365	18,700	19,896	113,316
Sept. 2	64.0	44.5	13.5	87.5	2,357	2,149	1,464	1,675	722	648	561	1,017	25,240	22,165	19,561	90,913
Sept. 9	62.0	41.5	15.5	86.0	2,290	2,048	1,423	1,806	667	569	501	1,153	26,865	17,485	21,586	104,351
Sept. 16	74.0	46.0	15.5	84.5	2,444	2,215	1,476	1,792	806	660	587	1,166	41,245	16,100	23,116	100,042


1935 1936 1937 1938 1939
AUTOMOBILE PRODUCTION
TOTAL OUTPUT CARS & TRUCKS U.S. & CANADA
THOUSANDS OF CARS
U.S. DEPT. COMMERCE
INGOT PRODUCTION
DAILY AVERAGE
THOUSANDS OF GROSS TONS
COMPILED BY AMERICAN IRON & STEEL INSTITUTE
FINISHED STEEL SHIPMENTS
THOUSANDS OF TONS
COMPILED BY U.S. STEEL CORPORATION
IRON & STEEL FOREIGN TRADE
COMPILED BY BUREAU OF FOREIGN & DOMESTIC COMMERCE
EXPORTS
IMPORTS
THOUSANDS OF TONS
NET OPERATING INCOME
FOR CLASS I ROADS
MILLIONS OF DOLLARS
COMPILED BY BUREAU OF RAILROAD ECONOMICS
MACHINE TOOL ORDERS INDEX
THREE MONTH MOVING AVERAGE
AVERAGE MONTHLY SHIPMENTS - 1926 = 100
PER CENT
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION
FOREIGN TRADE
VALUE OF EXPORTS & IMPORTS OF U.S.
EXPORTS
IMPORTS
MILLIONS OF DOLLARS
REPORTS FROM BUREAU OF FOREIGN & DOMESTIC COMMERCE
FOUNDRY EQUIPMENT ORDERS INDEX
AVERAGE 1922-24 = 100
PER CENT
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION
BUILDING CONTRACTS
TOTAL VALUATION IN 37 STATES
MILLIONS OF DOLLARS
COMPILED BY F.W. DODGE CORP.
COMMODITY WHOLESALE PRICE INDEX
1926 = 100
PER CENT
COMPILED BY U.S. BUREAU OF LABOR
1935 1936 1937 1938 1939
PIG IRON PRODUCTION
AVERAGE DAILY OUTPUT
BLAST FURNACE RATE
THOUSANDS OF GROSS TONS
PER CENT OF OUTPUT TO TOTAL CAPACITY
COMPILED BY STEEL
INDUSTRIAL PRODUCTION INDEX
ADJUSTED FOR SEASONAL VARIATION
AVERAGE 1923-25 = 100
PER CENT
COMPILED BY FEDERAL RESERVE BOARD
COMMERCIAL INSOLVENCIES AND LIABILITIES
IN UNITED STATES
COMPILED BY R.G. DUN & CO.
LIABILITIES
FAILURES
LIABILITIES IN MILLION DOLLARS
NUMBER OF FAILURES IN THOUSANDS
COPYRIGHTED STEEL
FREIGHT CAR AWARDS
COMPILED BY STEEL
SCALE GRADUATED ARITHMETICALLY TO SHOW ORDERS FOR LOW-VOLUME MONTHS MORE CLEARLY
NUMBER OF CARS









Flexible Metal

New manufacturing methods and improved materials expand applications of metal hose since a better product is now available at lower cost. Made in many types such hose furnishes efficient flexible connections for gas, liquid lines

■ PROGRESS in the development of hose and tubing which combine the stability, strength and safety of metal with a high degree of flexibility, is one of the outstanding technical achievements of the past half century. This achievement has given industry a unique form of flexible conductor for innumerable difficult services and has greatly enhanced the efficiency of various types of mechanical equipment where positive yet flexible connections are necessary between moving, or vibrating parts.

Various forms of flexible metal hose and tubing were made in the late 19th century in England, France and Germany from continuous strips of metal wound helically. At first, this tubing was used for ladies' bracelets, necklaces and watch chains, but it was soon discovered that it could be utilized in manifold industrial uses if a continuous packing were inserted in the spiral joints of the tubing to make it tight. Actual manufacture of flexible metal hose in the United States started about 1908.

Flexible metal hose today provides the answer to the problem of conducting compressed air, steam, oils, water, chemicals, etc., where ease of connection or motion between parts has to be considered. Development of modern machinery and equipment, including the extended use of hydraulic and pneumatic control devices, automatic lubricating systems, etc., has resulted in a growing demand for flexible tubing as well as increasing the demands upon it.

"Tailor-Made" Answer

The increasing use and broadening application of flexible metal hose and tubing is directly attributable to the excellent service record established by the manufacturers of this product during the past quarter century and to the fact that design en-

Upper left, seamless flexible tubing with bracket attachment conducting steam to movable platens of hot molding press. Center left, seamless flexible bronze hose takes steam to movable head of laundry press. Extreme left, bottom, vibration in air conditioning system is isolated here by seamless flexible bronze tubing with welded copper-tube end connections. Immediate left, interlocked flexible steel hose permits easy transfer of liquids by means of the portable pump. Photos courtesy American Metal Hose Branch, American Brass Co., Waterbury, Conn.

l Hose

By I. H. SUCH
Eastern Editor

gineers have found in flexible metal hose and tubing a "tailor-made" answer to many of their problems of design simplification.

Through the elimination of complicated piping systems with their packed connections, swing joints, etc. they have been able to cut costs by reducing installation time and maintenance expense. In many fields the demand for elimination of noise and vibration has been solved by the substitution of flexible hose connections for the solid piping once considered standard practice. The progressive improvement in manufacturing methods has resulted in a better product at lower cost, despite high material costs.

Two General Types Made

Flexible metal hose and tubing is manufactured in two general types. One is formed from helically wound continuous strips of metal, depending for its flexibility upon the mechanical movement between carefully designed bearing surfaces. The other, a convoluted metal tubing which may be of either seamless tubes or welded strip, derives its flexibility from corrugations so designed and proportioned as to allow flexing within the natural elastic limits of the metal.

Four different patterns of tubing are made from strip in the helically wound form. The interlocked type is designed for high pressures and strenuous service and usually is packed with asbestos yarn. The ball-bearing or German type is designed for more frequent bending and generally is packed with asbestos and covered with a wire braided jacket. The square-locked type, for average service, may be packed with asbestos, rubber or cotton, depending upon the requirements. The "high-ridge" or French type constitutes a fourth, generally asbestos packed.

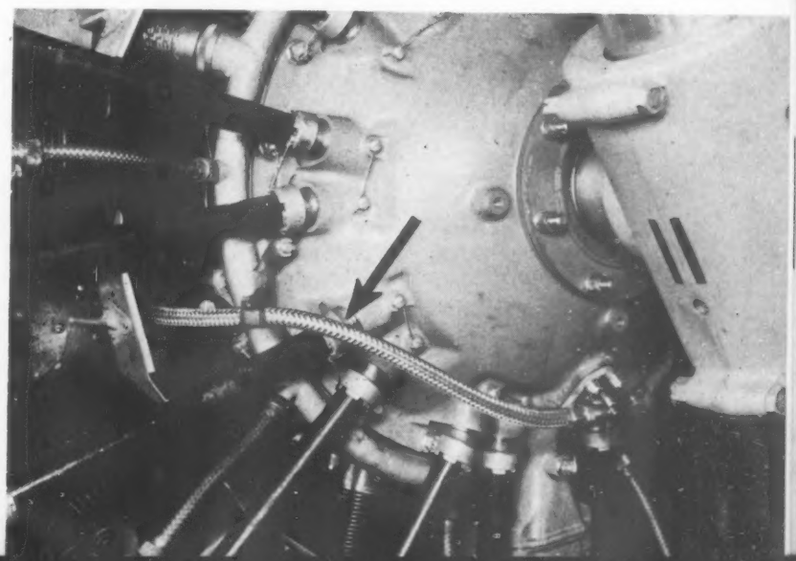
Made in a number of standard sizes, helically wound hose and tubing are available also in special sizes and shapes, including rectangular and multisided forms. The flat strip first is formed longitudinally and then wound helically, the joints interlocking or overlapping in the process.

The convoluted or continuous wall flexible tubing is fabricated in two types, seamless and welded, and depends for its flexibility upon the natural elasticity of corrugations, either annular or helical in form, which give it somewhat the appearance of an accordion. The seamless type, of course, is fabricated from thin-walled drawn tubing and the second from flat strip generally passed through an automatic butt welding machine, forming it into tubing which then is corrugated. The seamless type is being made in diameters up to 10 inches I. D. and the welded up to 24 inches. These are especially useful where highly volatile gases or liquids must be handled.

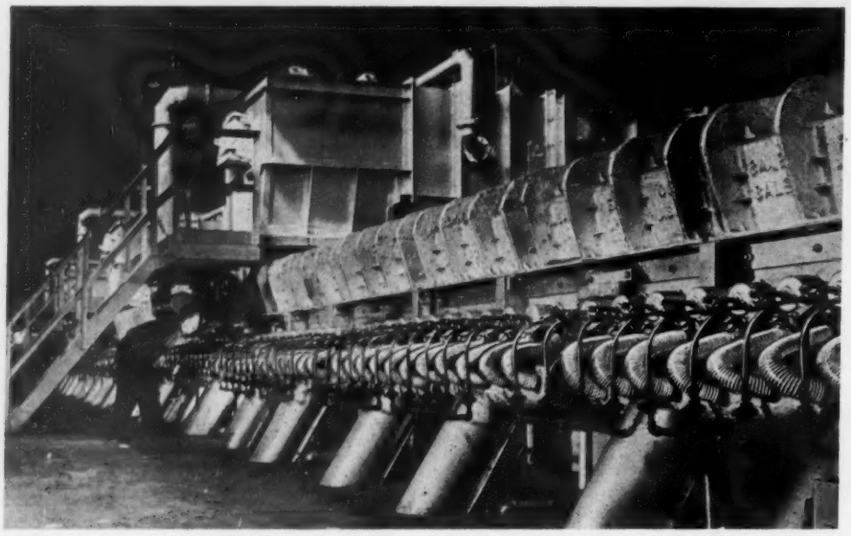
Tubing of the interlocked type which can be supplied in practically any size from ½-inch to 14 inches I. D. is available in practically all metallic materials, including copper, brass, bronze, monel metal, aluminum, steel and stainless steel. Brass, bronze and galvanized steel still are the most common types. Seamless tubing is available made from many workable metals.

Hose Available in Long Lengths

Recently manufacturing methods have been improved considerably with the result that seamless flexible tubing now is available in relatively long lengths and, of course,



Right at top, interlocked hose, 14 inches outside diameter, with 14-inch floating flanges, for a diesel engine exhaust line. Photo courtesy Pennsylvania Metallic Tubing Co., Philadelphia. Center, here a flexible metal hose is used from pump to cylinder on hydraulic hoist of dump truck. Photo courtesy Packless Metal Products Corp., Long Island City, N. Y. Bottom, flexible tubing (arrow) on oil line of airplane engine, also note high tension ignition leads in flexible tubing to shielded spark plugs. Such shielding is essential to prevent radio interference. Photo courtesy Titeflex Metal Hose Co., Newark, N. J.



Flexible metal hose serves yet another application as it conducts hot air from main to individual burners at Spang Chalfant Inc., Pittsburgh. Photo courtesy Chicago Metal Hose Co., Maywood, Ill.

any length may be had by simply welding or brazing sections. This type accounts for probably 25 per cent of total business done although introduced only a comparatively few years ago.

All types of hose often are given a protective covering of wire braid, asbestos, cotton, rubber or cellulose. Additions of one or more coverings of wire braids enable the tubing to resist extremely high pressures without sacrificing flexibility.

Many Applications

Applications for flexible metal hose and tubing are almost numberless. Some of them are particularly interesting. Two important individual fields of application currently are air conditioning and laundry equipment. In the former, most of the uses are for heavier equipment where vibration elimination is a problem. Sections of braid-covered seamless tubing, commercially known as vibration eliminators are set in the lines to absorb noise which otherwise might be conducted through the entire system. In the refrigeration field, many cities now are requiring the use of copper tubing covered with flexible steel or brass conduit for added safety. Flexible tubing also is being adapted rapidly in laundry equipment to connect the steam manifold of pressing machines to the swinging head.

The machine tool field uses flexible metal tubing made of oil-tempered steel wire for oil feed and coolant lines. Such tubing, of course, cannot be utilized where high pressures are involved since it cannot be packed. Its advantage lies in the fact that it will remain in the position into which it is bent. For oil feed lines under pressure, flexible metal pressure hose generally is used.

Flexible metal hose and tubing is finding an extensive outlet in the Diesel engine field where sections of it are used in exhaust lines to eliminate vibration and also to take up contraction and expansion. This is necessary inasmuch as Diesels usually are installed in flexible mountings.

The aviation industry promises to provide an increasing market due to the sharp gain in demand for both commercial and military planes. Large quantities of flexible metal tubing are used for connecting oil and fuel tanks with engines. Shielding high and low tension electric connections to prevent radio interference provides a further outlet.

One of the particularly interesting aspects of flexible metal hose and tubing development is the constantly broadening application in new fields of the basic engineering principles involved. Almost every day reports of new applications come to this industry's organization, The Flexible Metal Hose & Tubing institute, with headquarters at 150 Broadway, New York.

♦

Three-Dimension X-Ray Finds Depth of Flaws

■ Photographs taken by X-ray are two-dimensional only, and give no indication how far hidden flaws lie below surface. Mathematical formulas can be used for calculating depth, but these formulas, in addition to the computation they entail, are subject to errors as great as ½-inch. In the laboratories of General Electric Co., Schenectady, N. Y., a method for taking three-dimensional X-rays has been found.

Two photographs are taken of the metal part which is to be inspected, the second view being taken at an angle of about 5 degrees from the first. These two views are then placed in a stereoscope, which merges them into a single picture for the eye. Although the eye now sees a three-dimensional picture of the flaw, the problem still remains of converting depth into terms of actual measurement. It is necessary, in effect, to project an imaginary ruler into the interior of the solid metal block. The stereometer fulfills this function. Two wires in stereometer form the ruler. As wires are moved to one side or other, their images appear to approach or recede. The wires are moved until they correspond with position of flaw, and actual depth is read directly from a scale, without computation and with an accuracy of 1/16-inch. This method permits study of dimensional relations of one flaw to another and determination of the amount of dip or rise in extended flaws known as "pipes."

Slide Rule Gives Sleeve-Bearing Data

■ A slide rule distributed by Johnson Bronze Co., New Castle, Pa., instantly gives design dimensions of over 800 sizes of General Purpose sleeve bearings stocked by the company. Simple to operate, a movement of the slide shows the desired combination of inside and outside diameters and length of a sleeve bearing for any specified shaft size. All bearings so listed on rule are cast in S.A.E. 64.

Posture Studies

■ Interesting studies of the effects of proper and improper posture for workers in the steel and other industries are being made by Domore Chair Co., Elkhart, Ind. It has been found that workers sitting in a slouched position may rob themselves of as much as 24,000 cubic inches of air in an 8-hour day due to the cramped condition of the chest with consequent restriction of breathing, and that improper posture restricts muscular freedom and allows accumulation of fatigue substances in the muscles as well as in the circulatory system. This in turn produces inertia, gaping fatigue and general mental apathy.

In various tasks that require an unusual amount of concentration and skill, proper posture was found to be especially helpful to efficiency, reduction of accidents and time losses. Improvements in attendance records also were noted.

"I'm Bringing My Best Men"

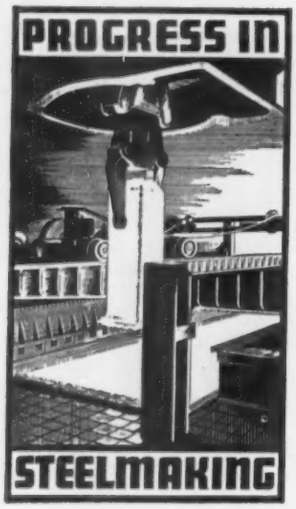
"It's a business proposition with me — bringing my best men to the National Metal Congress and Exposition for the week of October 23rd. I know my men will pick up enough information about new products and processes to more than pay their expenses on the trip.

"Why, one of my men heard a paper delivered at the Congress last year that cleared up a machining problem that had us stumped for four months. And another of my boys last year came home with a whole note-book full of ideas he had jotted down after seeing the exhibits at the Metal Show — ideas that made our production 20% more efficient than last year.

"I find it's a good thing for my younger men to get to the Metal Show for at least a couple of days, too. It gives them a broader vision in their work here at our plant — and makes them more valuable to me, and themselves.

"You can bet that I'll be on hand at Chicago for the week of October 23rd — I don't want my boys to know more about recent developments than their president."

National
METAL CONGRESS and EXPOSITION
INTERNATIONAL AMPHITHEATRE
CHICAGO ..... Oct. 23-27, 1939



Safe Practices

A number of steel plants have been extremely successful in establishing high safety standards. Detailed instances of how hazardous practices were changed to make possible some remarkable safety records are presented

By S. M. JENKS
Assistant General Superintendent
Carnegie-Illinois Steel Corp.
Gary, Ind.

■ WHILE a completely integrated steel mill may be composed of many units, a number of accidents have occurred in the rolling department where rapidly moving machinery and product require the constant attention of employes. Practices which have reduced frequency and severity of accidents in blooming mill and bar mill departments are described here.

The most important factor in preventing accidents is the human element, so entire mill crew is reviewed by roller or foreman before they start to work. This is done in a casual manner as the employes are greeted when they enter the mill. It is determined, as fairly as possible, whether any of the employes are fatigued, weak, or are otherwise physically unfit for work. In addition, it is an excellent practice for the roller to call all of his men together in a manner similar to the football team "huddle", and briefly discuss safety to bring out this thought: "Let us all resolve to prevent accidents to ourselves and to our fellow workmen throughout this turn." Such a discussion requires only one or two minutes of time and starts each man to work with a mind alert to the importance of safety.

Loose or torn clothing is, of course, extremely dangerous around revolving machinery such as rolling mills and auxiliaries and so the roller or foreman watches for this in talking with the men.

After a roller or a mill foreman has reviewed his crew, he looks over the equipment to make sure everything is in a safe running condition. The safety inspection of equipment often is delegated by the roller to a different member of his crew each week. This results in better training of employes and a keener interest in the condition of mill machinery. This practice has developed an admirable competitive spirit to determine who could make the best inspection and has led to many mill improvements.

Abstracted from paper presented at National Safety Congress.

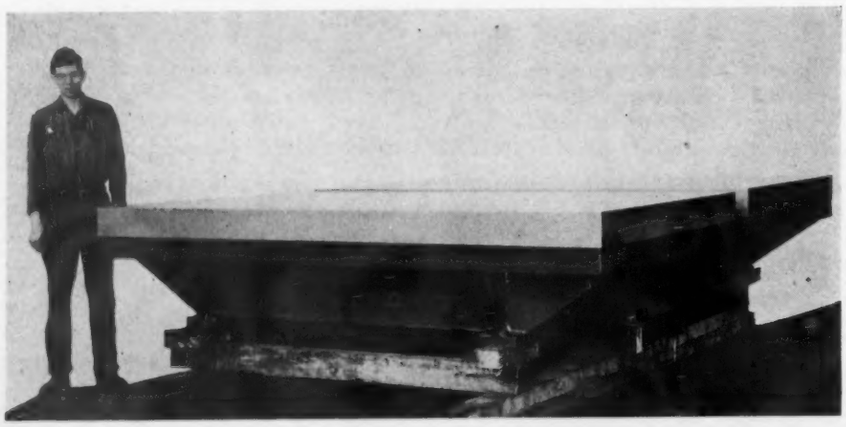
Safety Meetings Held

Safety meetings are held at regular periods with crews from several mills in attendance at the same time. At these meetings, the leader reviews accidents occurring recently in the plant and at other plants with similar equipment. A measure increasing the amount of thought given to safety has been to call upon various employes to discuss the possibility of a similar accident occurring to him or one of his fellow-workers, and asking what steps should be taken to prevent such a possibility.

Practically all plants have well-prepared safety rules but they represent time and money wasted unless continually reviewed and discussed at safety meetings.

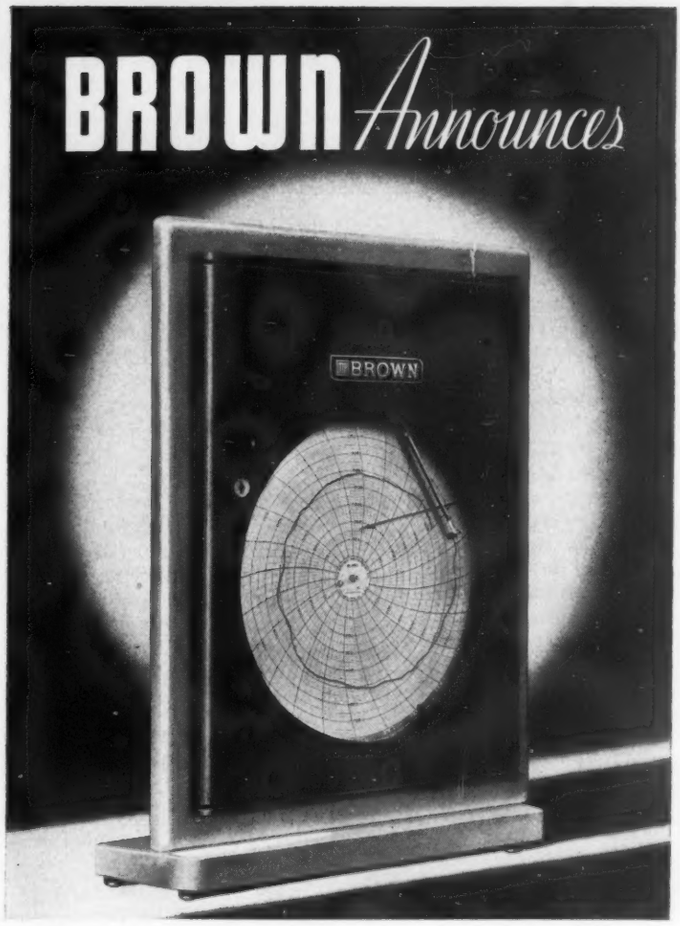
The steel industry started the compilation of rule books 25 years ago. With more diversified and complex operations, these books grew in proportion until they contained many regulations that could not be enforced. Two years ago our existing rule book was discarded and a new one prepared "starting from

Surface Plate Has Close Planity Tolerance



■ **Weighing about 7 tons, a new surface plate manufactured by the Goodman Mfg. Co., Chicago, is a one-piece casting of gray iron, stress relieved. It has a top surface 6 x 10 feet and is furnished either accurately machined or hand scraped to a true plane. The plates shown, two of four shipped to one customer, will be used side by side to form a surface 10 x 12 feet and are true to a plane within plus or minus 0.0005-inch**

BROWN *Announces* *a New Thermometer*



With justifiable pride The Brown Instrument Company presents the latest development in temperature and pressure recorders, indicators and controllers.

These new temperature and pressure instruments are entirely new inside as well as out. Advanced design of the operating mechanisms provides a new conception of *accurate measurement with simplicity* —the result of years of research and field testing under actual operating conditions by Brown Engineers.

The classic, simple lines of the modern streamlined case—styled by Henry Dreyfuss, designer of the "Twentieth Century Limited"—give added beauty and distinction to practical and serviceable instruments.

For modern panel mounting they blend with the panel surface and surrounding instruments to provide the much-wanted flush appearance.

Available with mercury, vapor or gas-actuated thermal systems—built to withstand vibration, shock and over-range temperatures.

Advanced Design Embodies:

SPIRAL ACTUATING ELEMENTS: Powerful, flat spiral, ample torque, especially heat-treated to insure permanent calibration. Have exceptional over-range capacity.

OVERLOAD SAFEGUARD: A special safety link between actuating element and pen arm contains a two-way spring overload release which also protects the mechanism from damage if the pen is moved in either direction manually.

PEN ARM: Stainless steel, 8" long, ribbed reinforcement, permits pen travel of 4¾".

RESILIENT MOUNTING: A rigid, flat sub-plate with 3-point, resilient suspension mounting carries all moving parts. Insures permanent alignment.

CHART DRIVE: Chart is firmly secured to driving mechanism by tapered hub and tapered chart positioning stud. Charts are punched to correspond with tapered studs on driving hub.

AUTOMATIC CHART TIMING: Charts when renewed are automatically in time; as the tapered position stud is in effect the hour hand of the electric clock.

RECTANGULAR CASE: Die-cast aluminum, dust and moisture-proof. Permits flush or front-of-board mounting.

The above-mentioned features are but a few of the many new developments found in the new Brown Thermometer and Pressure Recorders

For full details write The Brown Instrument Company, *a division of Minneapolis-Honeywell Regulator Co.*, 4462 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada: 117 Peter St. . . . Amsterdam-C, Holland: Wijdesteeg 4. . . . England: Wadsworth Road, Perivale, Greenford, Middlesex. . . . Stockholm, 16, Sweden: Nybrokajen, 7.

ADVANCED DESIGN

Assures

Accurate Measurement

with Simplicity

•

MODERN RECTANGULAR CASE

Styled by HENRY DREYFUSS

Designer of the **"Twentieth Century Limited"**

BROWN THERMOMETERS AND PRESSURE GAUGES

Accurate Measurement with Simplicity

scratch" with the thought in mind that if a rule couldn't be enforced 100 per cent, it did not belong in the new book of regulations.

In July, 1937, the new book was issued and contained only 23 rules, together with the penalties which had been established for violations. This rule book has been well received by employes and results obtained since its inauguration have been extremely gratifying.

To secure best results it is necessary to have fairly defined lines of responsibility. Safety work is no exception. Placing of responsibility for accidents has been a factor which has contributed a great deal to improved safety results. Holding the foreman or roller responsible is being followed in most steel plants, producing excellent improvements in safety records.

It is now a general practice in our steel plants to record and report unsafe practices as well as actual accidents. The purpose is to obtain information for a guide and for discussion in safety meetings. When discussed in open meetings, names of individuals are never disclosed. However, the person responsible is instructed in the correct way of performing the work in question.

In one group of mills having a daily force of 2500 employes, the above mentioned methods have been followed in an intensive manner. At this time, this same group has worked over 1,750,000 man-hours without a single lost time accident. While it is certain that many accidents will occur even if the described program is followed, it must be assumed that this system has contributed in the establishment of this remarkable record. During the period that these results were obtained, 4500 unsafe practices were listed and discussed at safety meetings, and the supervisory force made daily contacts with every workman, imparting a safety thought on instructions regarding the safe manner of doing a particular job. During the period this record was established 200,000 tons of steel products were rolled, processed and shipped.

A number of instances illustrate how mechanical improvements reduce accidents. Where a conventional hand grinder was used for conditioning bars and billets, the grinding wheel was not shrouded. If the wheel flew apart, as it frequently did, pieces could fly and injure nearby workmen. By placing a guard to shroud the grinding wheel, broken pieces are prevented from flying through the building. Guard is of simple welded construction and rigidly fastened to the grinder housing. Its use eliminated a serious hazard.

Shown below is a conventional pair of crane tongs constructed of round bars and slings for lifting hot-rolled strip in coil form. These tongs were guided into the coil by hand. Soon after they were put into use it was recognized that a workman might easily have his hand jammed between the tongs and the edge of the strip.

Safety on Straightening Machine

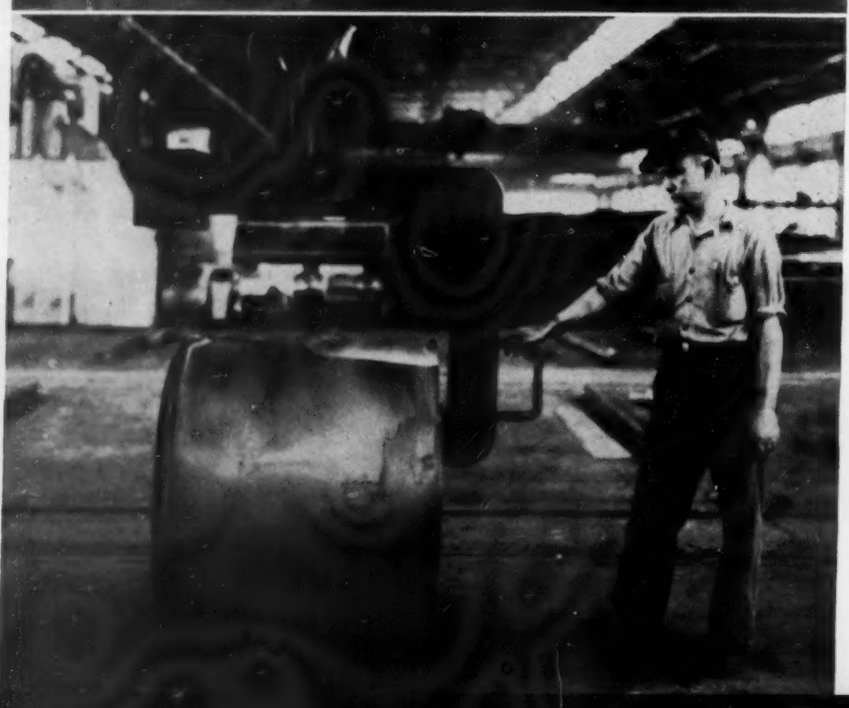
At bottom is a counterbalanced C-hook with extended handle. This was developed to correct the disadvantage of the coil lifting tongs shown above. It is evident from this illustration that coils may be handled without any danger of the operator's hand being injured.

In a conventional straightening machine for small round bars, the back end of the bar frequently develops considerable whip with the possibility of the attendant's arm being struck. To avoid injury from the whipping bar, a steel tube was placed between the entering nozzle and the approach table to confine the whip of the bar and to prevent it from striking the operator.

When operating a cold-roll straightening machine for small sections, it is possible for the operator to have his hands drawn into the rolls if the protection screen is out of place. However with the safety screen in the proper position, it is impossible for the operator's hands to be caught in the rolls.

In a vertical coiler, the drum is held in the "up" position for removal. Millwrights formerly held this drum up with a pinch bar and blocking, with one man holding the bar while the other worked underneath, removing bolts, etc. This practice was soon recognized as

(*Please turn to Page* 165)



Upper, a workman may easily have his hand caught between these tongs and the edge of the coil of strip. To prevent such a possibility, the counterbalanced C-type with separate extended handle shown below was developed

40% less dead weight.

. . . A "Natural" for YOLOY

Youngstown's high tensile alloy – YOLOY – has been winning battle after battle with old man Dead-Weight. This one was a natural.

These rolling chairs for the New York World's Fair were designed by the American Express Concessions, Inc. of New York and built by the Colson Corporation of Elyria, Ohio. The use of Yoloy sheets in this fabrication produced a dead weight saving of more than 40%. The manufacturer built a better product, the user gets greater safety, and rolling chair operators rejoice.

Whether you want to save work for human beings or to save dollars by cutting dead weight from machines, from engines, trucks, contracting equipment or mine cars, you'll find weight savings of 25% to 45% easily possible with Yoloy with no sacrifice in strength. Yoloy has an impact resistance 20% greater than ordinary carbon steels and a corrosion resistance 4 to 6 times greater.

Specify Yoloy for your equipment to decrease haulage costs and to increase pay loads and profit dollars.

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High Tensile Steel Yoloy is available in sheets, strips, plates, bars, shapes, manufacturer's wire, welding wire, seamless pipe and electric weld pipe.

3-65

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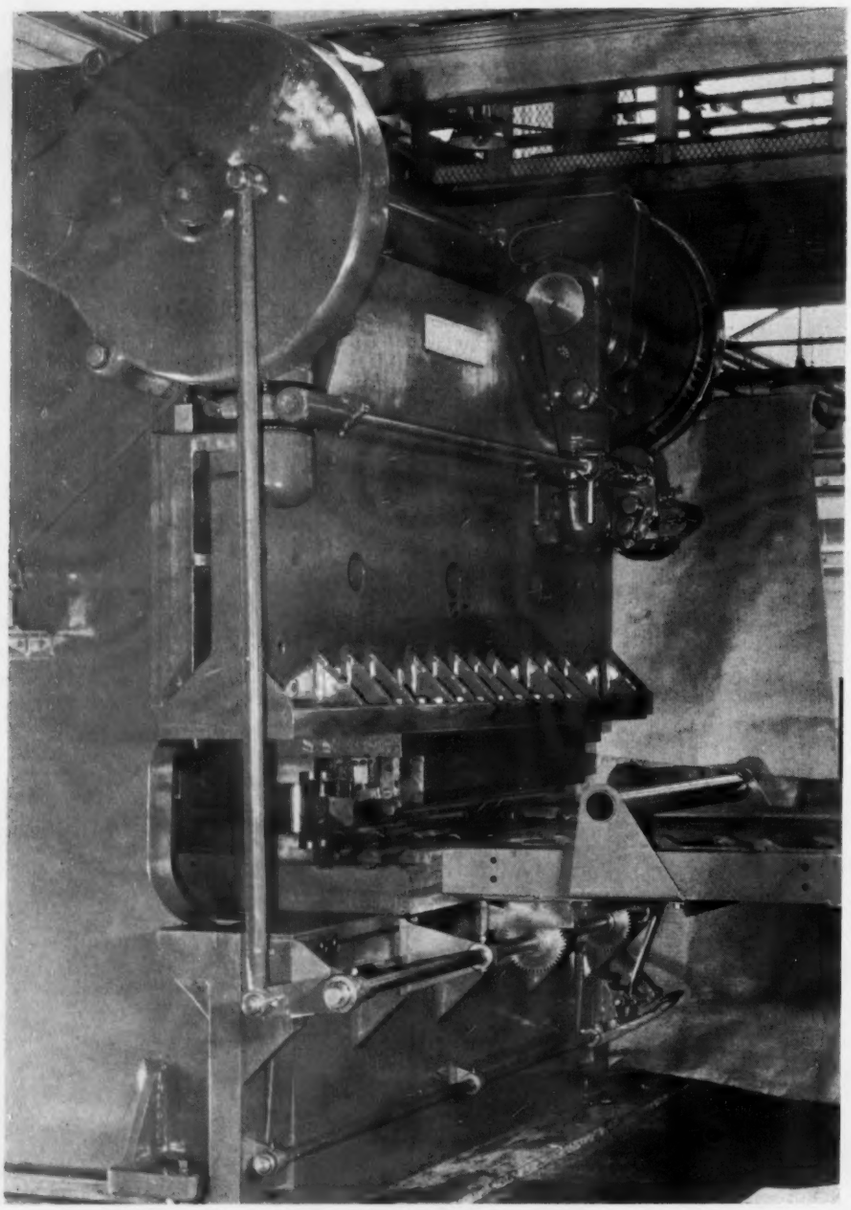
Steel "Bridges"

Heavy steel culvert sections are punched and formed in unusually efficient high-production setup. Corrugating and punching done together on one machine with automatic feed. Second machine accurately forms desired curvature



■ THE FIRST mention of steel bridges brings to mind large structures such as the Golden Gate and George Washington bridges. But the term "steel bridge" also covers an ever increasing number of large steel culverts in municipal parks, along highways and railroads. In fact, these might be called "mass production" bridges because they are made by mass production methods.

Republic Steel Corp.'s Canton Culvert Works, and American Rolling Mill Co., Middletown, O., have been unusually active in this field. The modern material for these bridges or culverts is steel plate properly corrugated for strength and accurately punched and curved for fast field assembly. To achieve proper corrugation with correct punching and curving, many progressive manufacturers have turned to the press brake as the most efficient answer to the production problems involved.

Corrugations Strengthen Plate

The steel plates range in thickness up to 9/32-inch and are further strengthened by large corrugations. Various lengths and widths of plates are used.

A Cincinnati press brake equipped with a special automatic feeding table is used at Canton Culvert Works for the first operation. Fig. 1 is a side view of this machine. The flat steel section is placed on the

Fig. 1 — Steel culvert sections are punched and corrugated on this 190 series Cincinnati all-steel press brake. Unit has special punching and corrugating die, wide ram and bed, and automatic feeding table. Figs. 1 and 3 courtesy Cincinnati Shaper Co., Elam & Garrard streets, Cincinnati

...fabricated with AIRCO Machine Gas Cutting

A 25 per cent discount on the purchase price of this important refinery equipment—that in effect is what this company got when they fabricated their heat exchanger from heavy steel plate with an Airco Radiagraph. All circles and beveled edges, as well as straight lines, were quickly, accurately, and smoothly flame cut with a portable, light-weight, Airco Radiagraph. » » » Airco Flame Cutting is the modern, economical method of fabricating steel parts and equipment. Cuts to closer tolerance, makes possible better assembled fits on piping and steel plates. Better fits mean better welds — at less cost. Better products, lower prices. » » » Why not investigate the Airco Flame Cutting Process further? It may be your way to improved products, increased production, or lower manufacturing costs. Full information will gladly be sent from any Airco district office. An inquiry will in no way obligate you.

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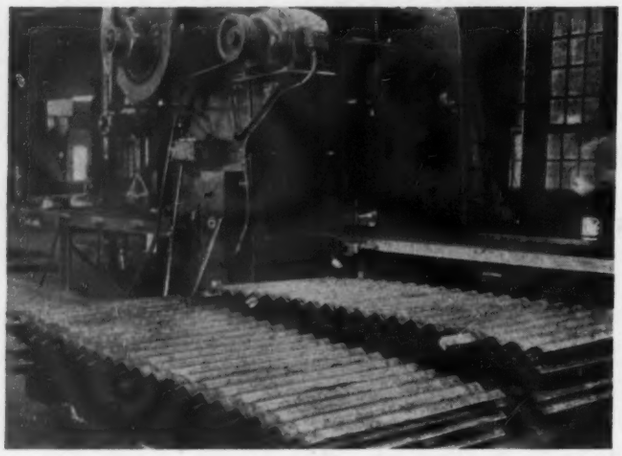


Fig. 2—Corrugated and punched steel culvert sections stacked on skids and ready for curving. Figs. 2 and 4 courtesy Republic Steel Corp., Canton Culvert Works, Canton, O.

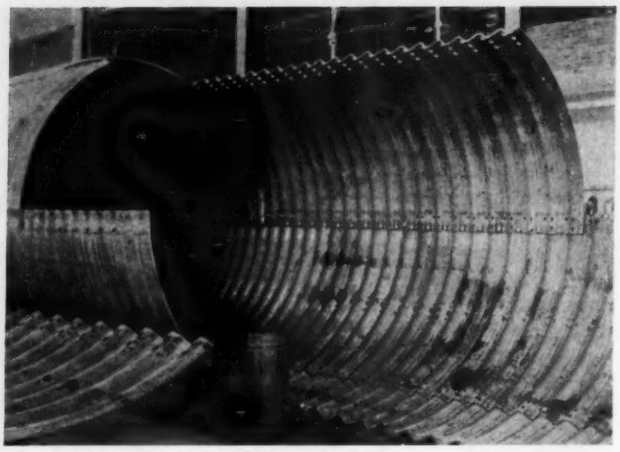


Fig. 4—Here punching, corrugating and curving have been done and some of the completed sections assembled to show the consistent accuracy obtained in these operations

feeding table and is positioned by hand against the pressure bar of the die. The pressure bar acts as a gage for the first corrugating hit. The section then feeds forward automatically. Successive hits then punch and corrugate in one operation the remainder of the section.

Punching on the crests and in the valleys is easily changed by shifting punches and inserting coupling nuts. The positions of the girth seam holes are controlled by a set of gags operated by a single lever.

Canton Culvert Works uses a special device to stack the sections on skids as they come from the machine. Fig. 2 shows the stacked sections. The stack of corrugated and punched sections then is lifted by a crane to another Cincinnati all-steel press brake equipped with a special curving die, Fig. 3. Here the section is curved to the correct radius. Change of radii in different gages of metal is accomplished by a simple adjustment of the press brake ram. Fig. 3 is a closeup view of this curving operation.

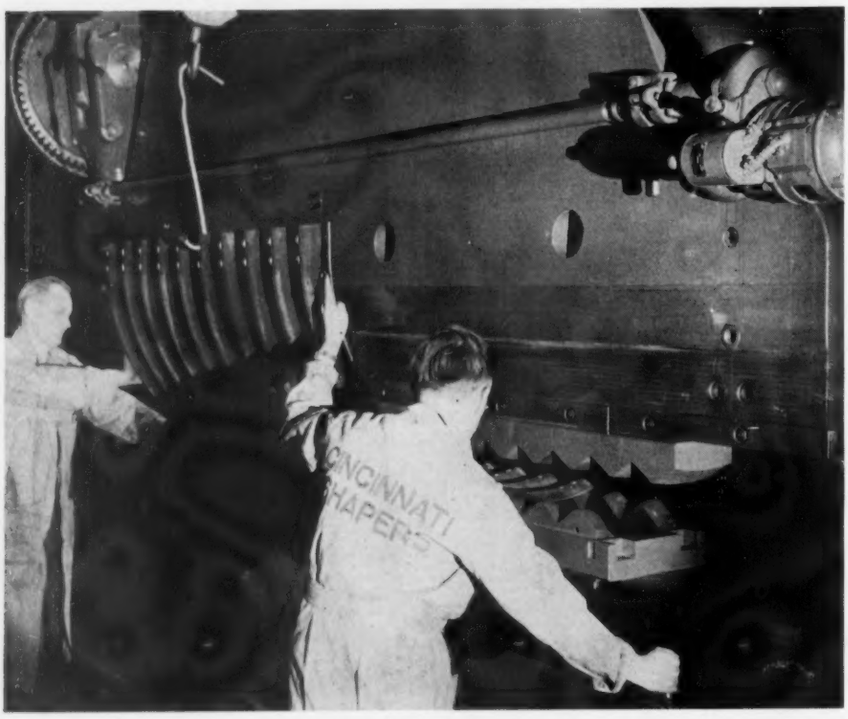
Accuracy and Economy Obtained

The advantages of this fabricating method are:

First, consistent accuracy of pitch in each corrugation and consistent accuracy of radius in each section, which assure fast field assembly.

Second, unusual economies in plant production. Punching and corrugating are done in one operation; curving in another. The entire job is done in three naturally progressive steps by the use of properly equipped press brakes.

Fig. 3—Here the sections are curved, using a 130 series Cincinnati press brake



An Introduction to Engineering Metallurgy

■ *Engineering Physical Metallurgy*, by Robert H. Heyer; cloth, 549 pages, 6 x 9 inches; published by D. Van Nostrand Co. Inc., New York; supplied by STEEL, Cleveland, for $4.50.

This volume is designed to aid those making their first acquaintance with engineering metals and alloys. As the author points out, information of a high order is available, but few attempts have been made to condense, correlate, and to bring up to date various materials, methods and concepts of metals technology.

The author has endeavored to produce a simple treatment of that field and to adapt it to the instruction of nonmetallurgical students. Although a wide range of materials within the major divisions of physical metallurgy has been included, the author has not attempted to approach the completeness of a handbook or to offer a laboratory manual.

The book is divided into 15 chapters dealing with the following subjects: Pure metals, principles of alloying, the white metals and their bearing alloys, light alloys, die castings, copper and its alloys, iron and carbon steels, heat treatment of steel, low and medium alloy steels, surface treatment of steel, steel castings, welding, cast iron, high alloy steels, tool steels. In addition the book contains an appendix and index.

SKF SPHERICAL BEARINGS ARE

in the Irvin Works

The increasingly widespread use of SKF Spherical Roller Bearings in the steel industry is concrete evidence of their ability to give good performance under severe conditions.

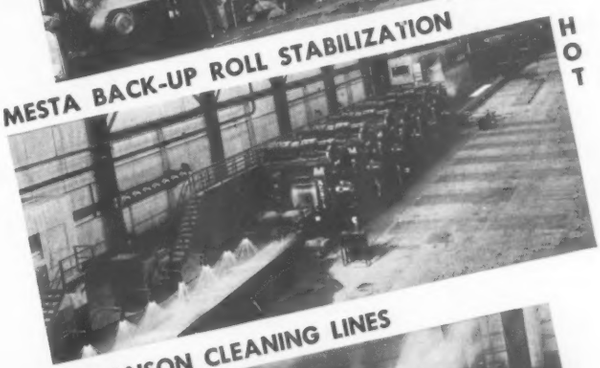
Steel mill men have *profited* from the carefree operation and long life obtained from mills incorporating the high capacity and inherent rolling alignment of SKF Bearings.

Submit *your* proposals to your nearest SKF representative, or write direct to our engineering department. SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa. 4408

MESTA COILERS

MESTA BACK-UP ROLL STABILIZATION COLD

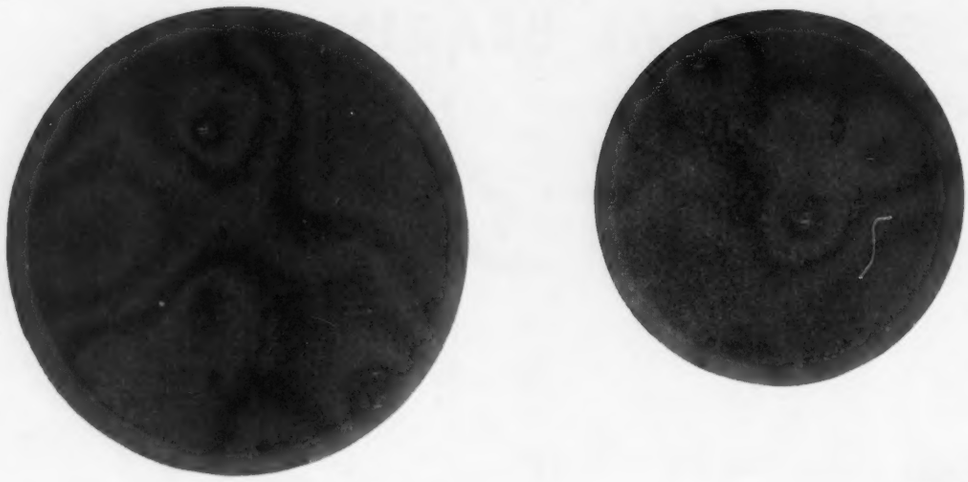
MESTA BACK-UP ROLL STABILIZATION HOT



UNITED-HANSON CLEANING LINES

FARREL-BIRMINGHAM DRIVES

SKF *Bearings*



Versatility in Carbon Tool Steels

These hardness penetrations for different sizes of 10 temper, shallow-hardening carbon tool steel were developed with a normal water quench at 1425 deg. F.

In cases where a deeper hardness penetration may be desired, two methods are available:

(a) Employ a medium- or deep-hardening 10 temper steel.

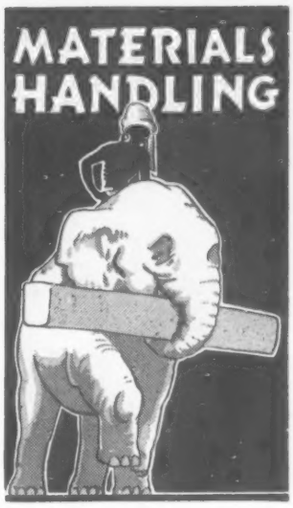
(b) Increase the quenching temperature to obtain the desired hardness penetration. This can be done on parts free from sharp changes in section without any deleterious effect, if a suitable steel is used. Bethlehem shallow-hardening carbon tool steels are specially designed to permit such a temperature increase.

The latter procedure makes it possible to obtain a depth of case normally attained only by using a deep-hardening steel and regular quenching temperature.

This versatility of Bethlehem carbon tool steels means lower inventory requirements, as fewer grades of steel have to be carried in stock.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY



Truck-Fed Conveyors

Movement of large volume of small parts through miscellaneous manufacturing operations is greatly facilitated by system of hand-lift and power-lift trucks working with many roller conveyors

■ BEGINNING 25 years ago, Ohio Brass Co., Mansfield, O., a 51-year-old plant, has developed a highly efficient handling system in which both power and hand trucks employing the skid-lift principle are coordinated with roller conveyors.

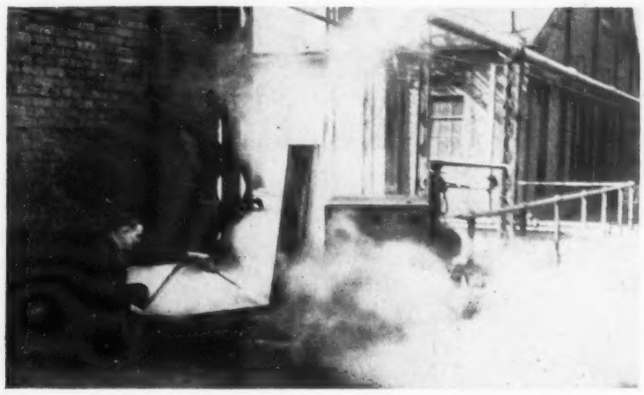
Outstanding feature of the system is its high degree of flexibility. With minor exceptions, materials move in unit loads which may be handled on either roller conveyors or skid platforms. The unit skid loads in turn may be handled singly by hand-lift trucks or in multiple with power-lift trucks. In addition, of course any of the skid loads may be handled by any of the lift trucks.

Thus with skid loads completely interchangeable with the trucks, maximum ease of handling is obtained with a minimum of handling equipment. Also, no lost motions occur when loads are transferred between the relatively short hand hauls within the individual departments and the longer power hauls between departments.

What has made this system possible is the fact that majority of parts handled are relatively small and fairly uniform in weight. This makes it practical to standardize on a comparatively small number of different sizes of skid boxes for han-

(*Please turn to Page* 166)

Fig. 1. (Right)—Each sectional bin contained here holds about 650 insulator caps. Fig. 2. (Below left)—Cleaning trucks periodically with live steam is standard maintenance practice at this plant. Fig. 3. (Below right)—Batteries are charged at night, also during the noon hour when necessary. Photos courtesy Thomas A. Edison Inc., West Orange, N. J.



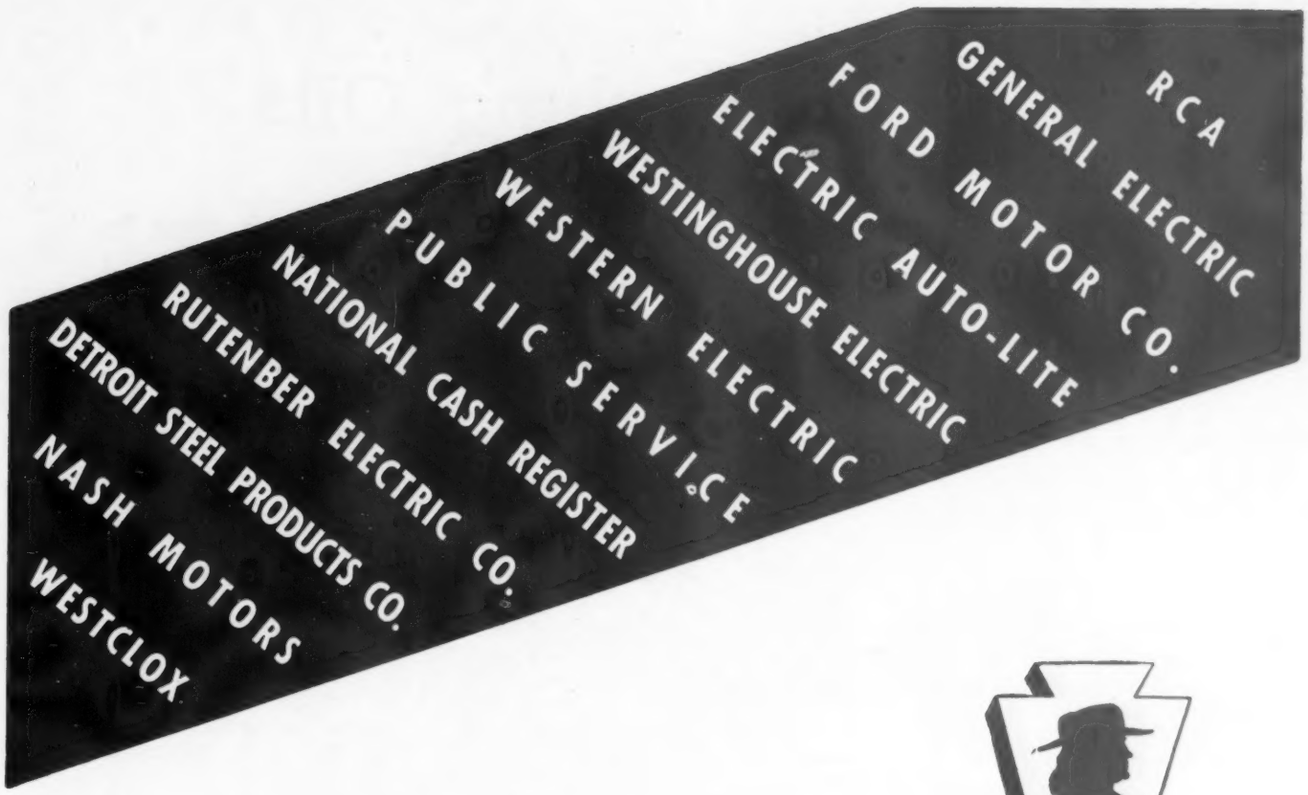
These leading companies entrust difficult metal cleaning problems to the new PENNSALT CLEANERS

READING CO.
YALE & TOWNE
DETROIT PLATING INDUSTRIES
KNAPP-MONARCH
REVERE COPPER AND BRASS
FLORENCE STOVE
STROMBERG-CARLSON
P. R. MALLORY & CO.
YORK ICE MACHINERY
BOHN ALUMINUM
EDISON GENERAL ELECTRIC

JUST three years ago a new heavy-duty metal cleaner was made available. Almost overnight it became famous. It brought startling new speed to difficult cleaning operations, cut through grease and grime, penetrated the dirt, and left the metal surface characteristically bright and clean. Its economy was equally notable, for a small quantity went a long way, and the saving in time was enormous.

This cleaner is known today throughout industry. Its name is Orthosil. Companion cleaners have been developed to meet the diverse and extreme demands of industrial product cleaning. Together with Orthosil they form a complete group meeting every requirement with custom-built precision.

They are the Pennsalt Cleaners for Industry — a new line of metal cleaners with exceptional dissolving and emulsifying ac''on as well as tremendous lasting power.



The Pennsalt Cleaners are new but not untried. They are already in widespread use, as shown by the prominent companies using them — some of whose names you see above. Although their problems differ as widely as their products, which range from silverware to locomotive parts, these famous concerns have had remarkably similar experiences with the new Pennsalt Cleaners. They enjoy uniformly quicker, more thorough cleaning, excellent surface finish, and unusually low cleaning cost.

Why not let us prove these same superiorities to you in your own cleaning operations? Write us for full information on the Pennsalt Cleaners for Industry. Address Dept. S. Pennsylvania Salt Manufacturing Company, Widener Building, Philadelphia, Pa. — New York • Chicago • St. Louis • Pittsburgh • Tacoma • Wyandotte.

TRADE MARK

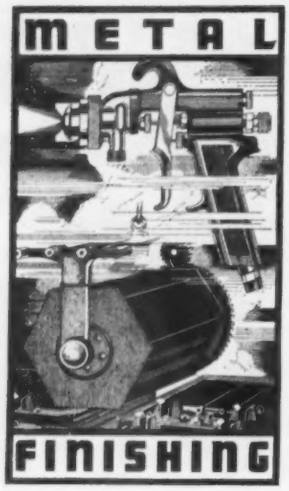
Other Pennsylvania Salt chemical products used in large quantity by industry

CHLORINE
ANHYDROUS FERRIC CHLORIDE
SAL AMMONIAC
MINERAL ACID
CAUSTIC SODA

•

PENNSALT
CLEANERS FOR INDUSTRY

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals



Slushing Oils

Use of proper slushing oils offers a means to prevent damaging rust. However, as detailed here, the oil must be chosen with due consideration to all factors if best results are to be obtained

■ WHEREVER sheet steel, machine parts or machinery are to be stored, handled or operated, rust prevention is most essential. The annual cost of rust to industry probably amounts to an amazing sum.

Rust does not always render a piece of steel or an operating mechanism incapable of subsequent usage. In many instances, however, absolutely no rust can be tolerated. An antifriction bearing or a steel file is not salable if it has rust on it. Machinery which must be held inoperative over certain periods of the year likewise must be protected against rust. Likewise, rust prevention is a major problem wherever sheet steel is rolled.

Rust is the result of oxidation in the presence of moisture at normal temperatures. There is little reaction between oxygen and iron or steel if the surface of the metal is absolutely dry. This point cannot be over-emphasized.

Moisture deposits may be due to incomplete drying or to condensation from the air. Moisture is especially apt to be present where the drying operation is carried out by direct contact with live steam. Under such conditions, a final treatment with hot dry air would be more effective in removing the last traces of moisture. It is important to remember that metal kept warmer than the surrounding air will not have moisture condense on it.

Low Viscosity Oils

An ideal slushing oil for use on a steel surface should be easy to apply, give maximum protection against rusting, be easy to remove when protection is no longer required. These requirements are most usually met by oils of low viscosity, ranging from 35 to 250 seconds Saybolt Universal at 100 degrees Fahr.

A slushing oil has three functions when applied to steel shapes, sheets or coils: to prevent rust formation on the surfaces during shipment and storage, to furnish lubrication between the metal layers to prevent marking during shipment, to provide a lubricant for subsequent drawing operations.

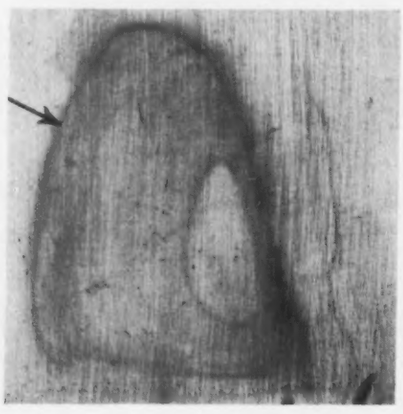
Water Penetrates Mineral Oil

Slushing oils as generally used are either straight mineral oils or special rustproofing oils of petroleum base.

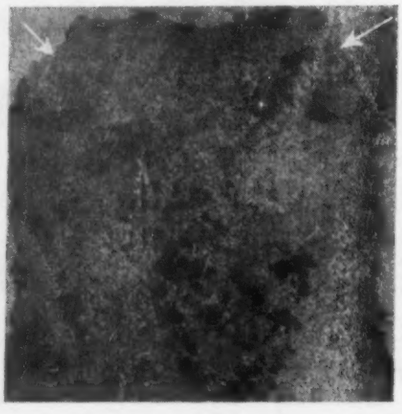
Straight mineral oils are usually well-refined lubricating oils containing no fatty oils or other added materials. Either paraffin or naphthene base oils can be used with equal results. Since these oils are most economical, they are widely used in the steel industry. While they furnish good lubrication, under some conditions they do not give complete protection against rusting. Water coming in contact with the steel, even after oil is applied, tends to penetrate a straight mineral oil

Abstracted from *Lubrication*, a publication of The Texas Co., 135 East Forty-second street, New York.

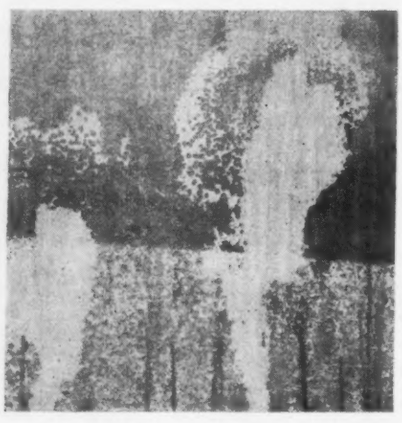
Showing type No. 1 rust formation. Arrow indicates rust which has formed on an "island" or bare spot. Note shape assumed by this type of rust formation

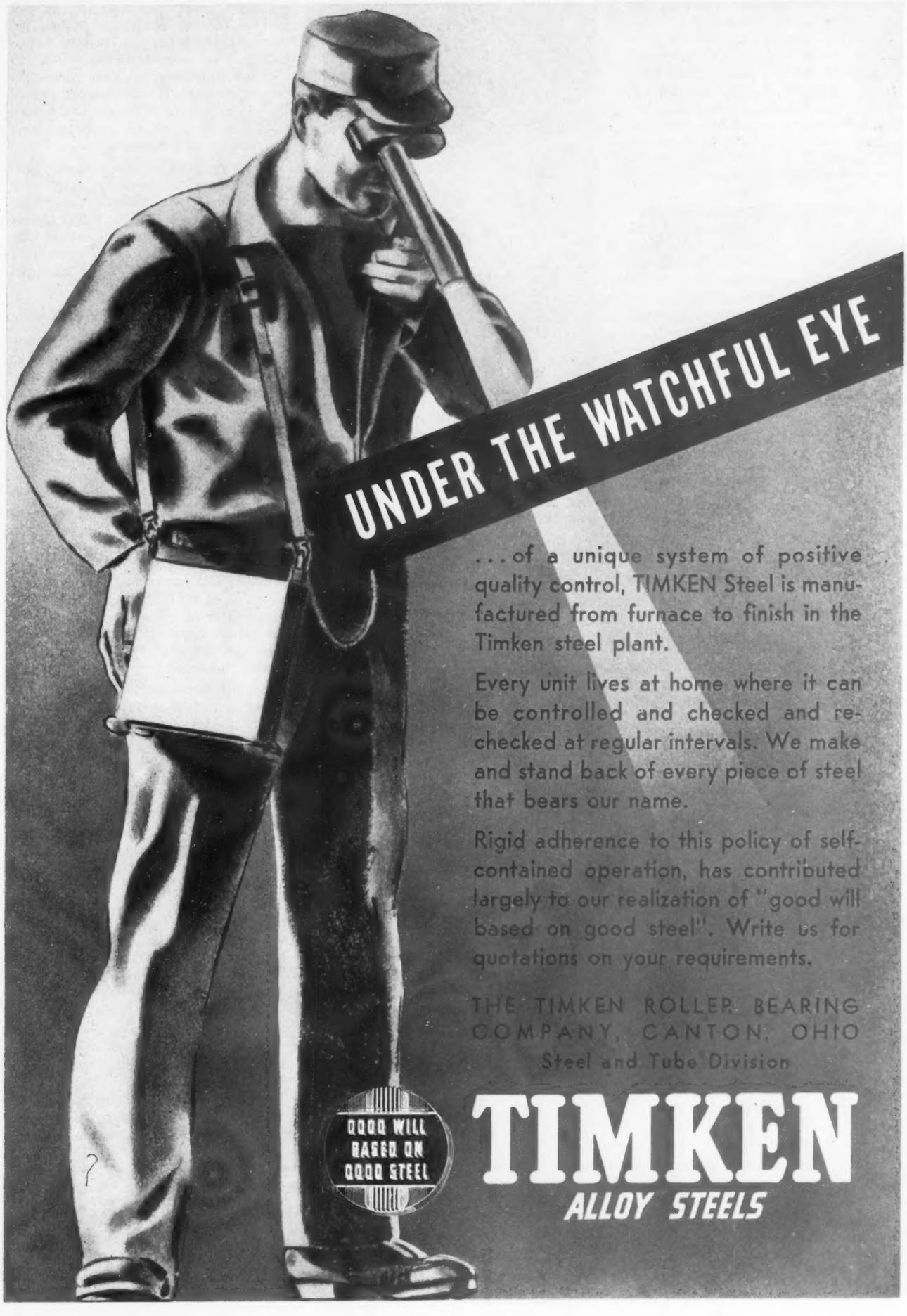


A faint film of rust covering most of the steel surface is No. 2 rust formation. Arrows indicate heaviest portion



Extreme example of type No. 3 rust formation. Rust streaks run same direction here




UNDER THE WATCHFUL EYE
. . . of a unique system of positive quality control, TIMKEN Steel is manufactured from furnace to finish in the Timken steel plant.
Every unit lives at home where it can be controlled and checked and rechecked at regular intervals. We make and stand back of every piece of steel that bears our name.
Rigid adherence to this policy of self-contained operation, has contributed largely to our realization of "good will based on good steel". Write us for quotations on your requirements.
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division
QQQQ WILL BASED ON QQQQ STEEL
TIMKEN
ALLOY STEELS

film, wet the surface and rust the steel, often in a few hours.

Straight mineral oils for rust prevention service range in viscosity from 85 to 250 seconds Saybolt Universal Viscosity. Oils above 250 seconds in viscosity are not generally used because the added lubrication may cause the stacks of sheets to slip or skid while being transported, the cause of many bad accidents.

Finished steel storage rooms should be kept at approximately 75 degrees Fahr. all winter and care taken to keep out drafts of cold air to prevent condensation. Under these conditions, there is little difficulty with rusting where straight mineral oils are used. However, if unwrapped steel is exposed to normal temperature variations for any length of time, rusting is sure to occur. Here straight mineral oils give little protection, slushing oils with greater rust-resisting qualities being necessary.

Oils Use Thinners

Special rustproofing slushing oils are composed chiefly of low viscosity petroleum lubricating oils or volatile thinners mixed with smaller amounts of other materials to give protection against rust. Thinners carry and spread the rust-preventing material uniformly. Viscosity usually ranges from 35 to 250 seconds Saybolt at 100 degrees Fahr. Other more viscous products also are used to coat exposed surface of stacks and coils.

Materials sometimes included in slushing oils are fatty compounds of various kinds, soluble soaps, soaps not soluble in water, metallic compounds (organic), mineral oil derivatives and halogenated materials. While all of these impart rustproofing qualities, some are much more effective than others and some attack the metal after long period of storage.

This is No. 6 type of rust formation, caused by drops of water falling on the steel. Arrows indicate heaviest formation

Lanolin, lard oil and other fatty oils give slushing oils greater properties of adhesion to the steel. They also tend to form emulsions with any moisture that may be present, thus keeping the water from wetting the steel and thereby preventing rust. Some fatty oils, however, upon long contact with metal tend to form fatty acids which may corrode the metal.

Soap of Value

Soaps soluble in water are of value in that they will emulsify with any moisture coming into contact with the metal. Soaps insoluble in water are less satisfactory in this regard but are beneficial in that they increase the adhesiveness of the oil for steel.

Some slushing oils containing from 10 to 30 per cent of a suitably prepared rust preventative mixed with a volatile thinner appear to give excellent results. After application the solvent evaporates to leave a thin layer of rust preventative, very adhesive and highly resistant to moisture. These oils range in viscosity from 35 to 70 seconds Saybolt at 100 degrees Fahr.

Special rustproofing oils are particularly useful where storage conditions are poor, where steel is exposed to atmospheric temperature changes, and where shipments are to be made in winter when extreme temperature and humidity changes cause the steel to "sweat."

Moisture Usually Cause of Rust

Investigation of rusting complaints in many steel mills has disclosed that the oil is usually considered to be at fault. In most instances, however, other conditions have been found responsible. The basic cause is moisture. In other words, moisture and air must be present for rust formation to develop.

Procedure in analyzing such conditions is as follows: Analyze samples of the original unused oil to determine if any moisture or other contaminant is present. Also analyze samples of oil from the steel as well as samples of the steel showing rust or other deposits. A laboratory analysis of this type usually discloses the trouble.

Set up corrosion tests in the plant using the steel and oil under investigation. Observe processing of the steel just prior to oiling. Also observe storage and shipping conditions after oiling; look for contact with moisture at some point.

Observe methods of handling the slushing oils. Oils handled carelessly often become contaminated with water, sure to cause trouble.

Types of rust and corrosion are classified below. Illustrations show each type. Although these observations were made chiefly in sheet steel mills, the principles involved also supply wherever steel articles are handled.

Type No. 1. Bare spots or "islands" are always present between oiled steel sheets. They appear to be air bubbles flattened out by the pressure. Oil creeps away from any such bare spot due to surface tension. Rust on these spots is due to a slight amount of moisture present on the steel just before it was oiled. To overcome this type of rust, dry the steel completely before oiling.

Type No. 2. A faint film of rust covering most of the sheet steel surface is caused by steel being incompletely dry before oiling. In this case, rust probably begins to form

Formation type No. 5, caused by finger marks, looks like this

Now if you want details . . .

here they are

Twin Disc MT Clutches are furnished either as a single, multiple disc clutch or as a double multiple disc clutch, called a duplex.

The duplex model consists of two single clutches combined in one unit, having a common engaging cone and operating lever.

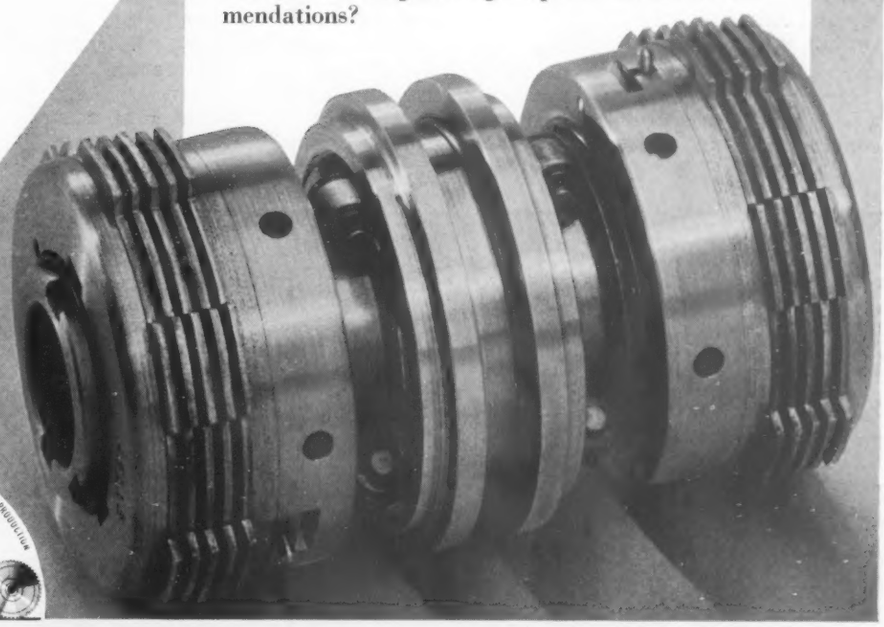
Both the single and the duplex clutches are available in either "dry" type or in "oil" type.

Dry type clutches are particularly suitable where a compact clutch of high torque capacity with comparatively low operating pressures is required: cut-off service for example. The dry type may also be used as operating clutches where frequency of use does not dictate a clutch of the oil type.

In the "dry" type Twin Disc MT Clutch, the friction surfaces of the driving plates are asbestos and the driven plates are of saw steel, heat-treated and ground.

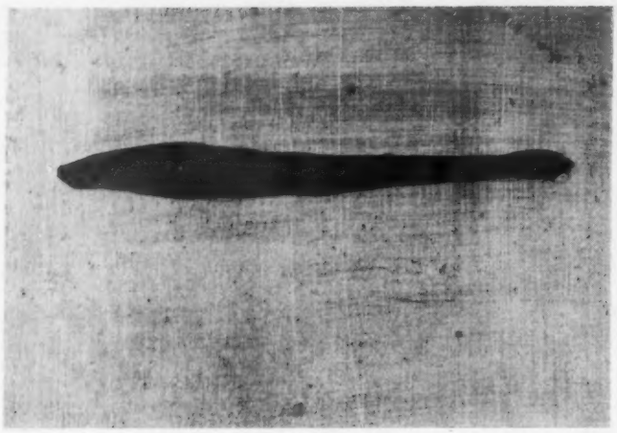
In the "oil" type clutches, the driving plates are of hard, phosphor bronze, perforated with oil release holes and the driven plates are of saw steel with radial grooves for quick oil release. This assures positive, smooth engagement . . . a minimum of drag between the clutch plates when the clutch is operating in disengaged position.

There is a Model in Twin Disc MT Clutch line that has a place on your Machine Tool because it will add to the performance of your machine. It will do its job with a minimum of attention because it is "built-for-the-job" by clutch specialists. Why not ask our Engineering Department for recommendations?

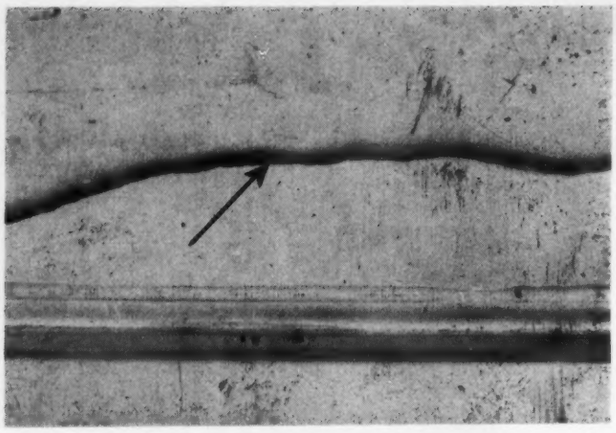


TWIN DISC CLUTCH COMPANY • 1379 RACINE STREET, RACINE, WISCONSIN

● **California:** Los Angeles, Charles W. Carter Co.; San Francisco, Charles W. Carter Co. **Colorado:** Denver, Liberty Truck and Parts Company. **Illinois:** Chicago, Motive Parts Co. of America; Chicago, Western Contractors Supply; Chicago, Wisconsin Industrial Parts. **Massachusetts:** Boston, Rapp-Huckins Co., Inc. **Kansas:** Great Bend, Scheufler Supply Co. **Maine:** Portland, Southworth Machinery Co. **Michigan:** Detroit, Whitney Brothers. **Minnesota:** St. Paul, Truck Parts, Inc. **Missouri:** St. Louis, Auto Parts Company. **New York:** Buffalo, Edward W. Rode; New York City, Twin Disc Clutch Parts & Service of New York, Inc. **Ohio:** Cincinnati, C. McCash; Cleveland, Industrial Engine Parts. **Oklahoma:** Tulsa, Twin Disc Clutch Company. **Oregon:** Portland, Berg Evans Chain Company. **Pennsylvania:** Pittsburgh, Contractors Equipment Service Company; Philadelphia, Maerky Machine Works. **Tennessee:** Knoxville, Automotive Equipment & Supply Co. **Texas:** Dallas, Twin Disc Clutch Company; Fort Worth, John Muller Company; Houston, Portable Rig Company, Inc.; Houston, John Muller Company. **Utah:** Salt Lake City, Lund Machinery Company. **Virginia:** Richmond, Standard Parts Corporation. **Washington:** Seattle, Berg Evans Chain Company.



Showing what sometimes happens when metal pins in pickling racks come into contact with the steel. This is type No. 7 formation



Type No. 8 rust formation usually is indicated by yellow streaks or designs on steel stored for some time. It comes from action of fatty acids

prior to the oiling operation. It can be eliminated by complete drying before oiling.

Type No. 3. Rust in thin streaks is caused by minute streaks of salts which remain on the steel following a lime dip after pickling. Even though the steel surface is dried by heating, these salts may retain sufficient moisture to cause rust formation within a few weeks, especially if covered by a straight mineral oil. Special rustproofing oils, however, will minimize such formation. This trouble also is overcome successfully by giving the steel a final dip in a tank of boiling water to wash off the lime salts before drying and oiling.

Type No. 4. A heavy coating of rust on outside of stacks of steel sheets and steel coils is a prevalent type of rust formation caused by condensation of moisture on the cold steel, called "sweating." High humidity alone is not responsible for this rust formation. Temperature is the chief factor, because moisture will condense on the steel whenever it becomes cooler than the surrounding air.

It may be prevented by keeping the storage room heated in winter to prevent sudden temperature changes, by using one of the "special rustproof" type of oils for slushing sheets, or by covering outside stack surfaces with a light grease or paste compound to give added protection and seal up cracks between sheets.

Type No. 5. Finger marks are usually caused by handling steel when hands are wet with perspiration. Tool steel is especially susceptible to rust from this source. It has been overcome in some mills by having operators handle the steel with cotton gloves, dipping the steel in hot rustproofing oil or by using one of the "special rustproof" oils for slushing.

Type No. 6. Splashes of rust, usually green or brown and resembling drops of water splashed on the surface, have been found caused by steam condensing on the steel roof and dropping onto the sheets. Drops were quite corrosive due to pickling acid fumes in the air. The trouble was eliminated by exercising greater care in handling and storing and by keeping the condensed moisture from falling on the steel.

Type No. 7. Pin marks usually indicate the place where the metal pins of pickling racks touched the steel sheets. This type of rust is quite common and apparently is caused by a trace of moisture retained under a thin layer of scale. Use of special rustprof oil will tend to minimize this type.

Iron Soap Formed

Type No. 8. Yellow streaks and designs found on steel stored for several months were composed of iron soap formed by the corrosive action of fatty acid in the slushing oil which had been used on the steel. Slushing oils containing easily oxidized fatty oils are apt to cause this kind of corrosion. The trouble can be prevented by selecting the proper type of slushing oil.

Type No. 9. Grayish, cloudy corrosion with peculiarly shaped streaks is caused by presence of mineral acid in the slushing oil. This has been observed on steel coils within a few hours after they have been slushed with certain types of special rustproof oils. Analysis showed they contained chlorinated compounds which decompose under heat into hydrochloric acid. Even though present only in a small

(*Please turn to Page* 147)

A grayish cloudy appearance, such as shown here, is type No. 9. Notice peculiar shape of streaks. This comes from use of oils containing chlorinated products

Machine Tool

SHOW on PAPER

The postponement of the much anticipated Machine Tool Show, and the circumstances causing this postponement, are of course very much regretted. However since "the industry and its customers cannot afford the time of their key men for a Machine Tool Show*" then of course show values now denied can best be attained through the printed page.

Under the circumstances which we are now entering, we feel that we would be remiss in our duty were we not active in supplying the metalworking industry with the fullest possible information on the latest developments in machine tools, and particularly so since the industry will be denied the advantages of the Machine Tool Show.

—*The Publishers of* STEEL

*Wendell E. Whipp, President
National Machine Tool Builders Association

THE MONARCH MACHINE TOOL CO. — SIDNEY, OHIO . . . U. S. A.

Here's What You'll See in the Monarch Booth

After registration, walk into the main auditorium. The Monarch exhibit is the first large space on the left as you enter the great arena. Here you will see 14 Monarch lathes of various sizes and types...the result of long-continued research and unending development to make them produce more and better work...in shorter time, and with less operator effort and fatigue. You will see how Monarch tool maker's lathes and engine lathes, with various attachments, have broadened the scope of profit possibilities to an extent never previously approached through the use of the lathe.

MAKE MORE MONEY W

Eight of Monarch's Cleveland Show Machines, representing the latest developments in lathes, are now on display in our new showroom at Sidney, Ohio, where visitors are always welcome.

FOR THE FIRST TIME . . .

A new tool maker's lathe will be shown. It is streamlined and equipped with finger-tip controls—it is fitted with a new device for chasing threads to almost unbelievable lead accuracies.

RECENTLY INTRODUCED . . .

Two of the new 10″ x 20″ sensitive precision tool maker's lathes, which were recently introduced, will be shown. These lathes operate at speeds as high as 5000 R. P. M. Almost any speed is instantly available. So many people will want to see these lathes, that two of them have been placed on exhibit at the show.

FOR THE FIRST TIME . . .

The new Monarch-Keller-Kelly-shaping lathe will be shown for the first time. It will be doing the work . . . making dies, moulds and shapes impossible to conceive being done on a lathe. You won't believe it unless you see it! Literally, it will reproduce almost any shape that a cutting tool can machine . . . and, in a fraction of the time required by any other known means. Two new streamlined lathes, each providing 100 to 1 range of spindle speeds, one powered hydraulically and the other electrically, each arranged to automatically maintain any desired surface cutting speed, will be in operation. One will be a tool maker's lathe and the other an engine lathe.

ANOTHER LATHE DEVELOPMENT . . .

Another lathe representing an outstanding Monarch development will be shown machining four different classes of materials, and automatically maintaining the correct or desired surface cutting speeds on all diameters. The profit possibilities in the use of these machines, on many classes of turning work, are literally breath taking. One large manufacturer, who is using two of these machines, states that they saved their original cost in the first four months' use. Another user reduced costs 75%.

RECENTLY AVAILABLE . . .

Then, you'll want to see Monarch's Automatic Sizing lathe in operation. The controls make the lathe an automatic machine so that one operator can attend two or more machines with no more effort than is required to handle one manually controlled lathe. These machines have been on the market for only the past few months. You cannot afford to miss seeing these machines in operation.

MAGNA-MATIC

The Monarch Magna-Matic automatic lathe will be shown on a variety of work. The fact that the "set-up" time on these machines is only 5 to 10 minutes or less will be demonstrated, as well as interesting evidence of their unusual metal-removing ability.

Last but not least, we will be Flame Hardening the way surfaces of lathe beds and other parts for our machines, just as we do on a production basis in our factory at Sidney. This revolutionary process of eliminating wear and preserving accuracy, the result of Monarch research, should prove of interest to every user of machine tools.

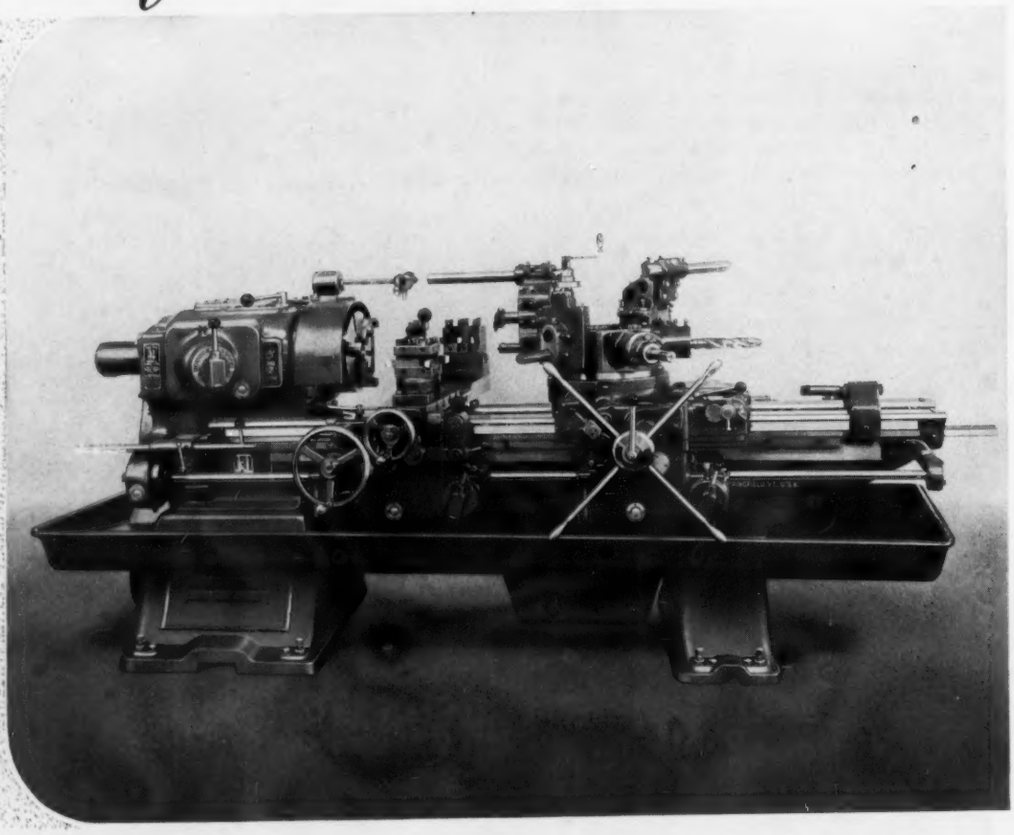
This is necessarily a brief description of the machines you will see in the Monarch booth. Each and every one of them was developed to meet requests by customers for machines that would help them make more things for more people at lower production costs. We suggest that you allow plenty of time for the Monarch Exhibit.

WITH MONARCHS!

First yesterday — and first today, Jones & Lamson builds for tomorrow!

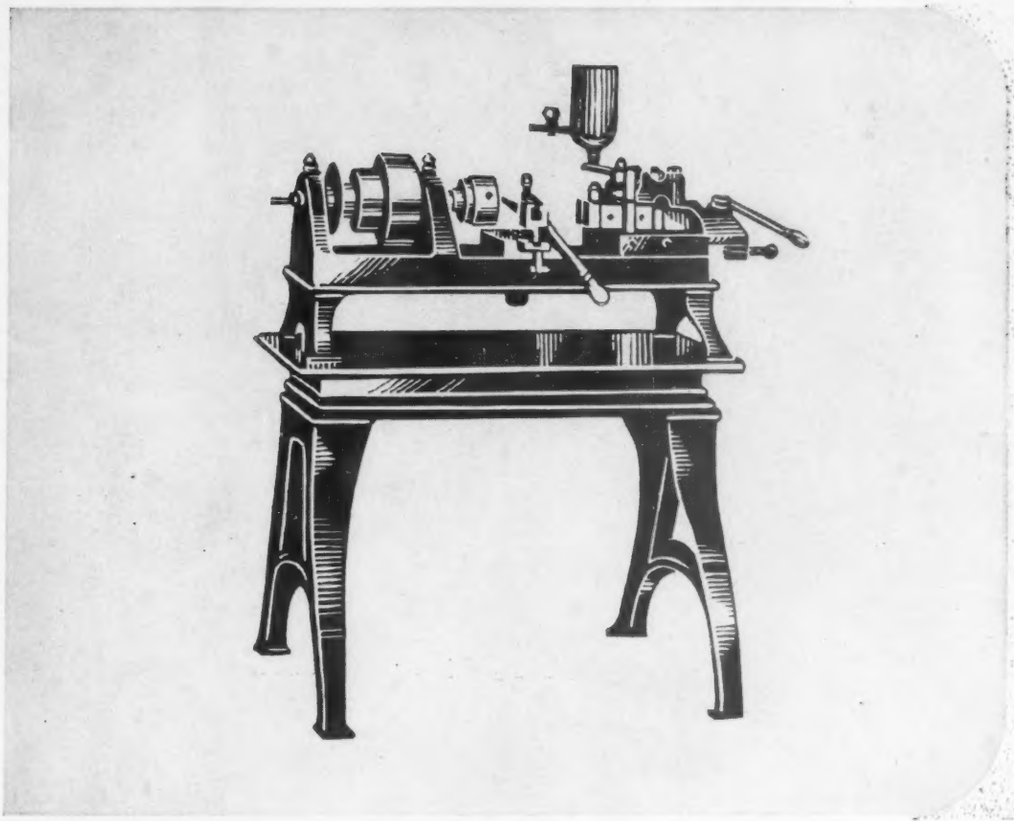
1939

No other equipment of comparable size and capacity combines the surplus speed, power and rigidity built into Jones & Lamson machines of today.



JONES & LAMSON

SPRINGFIELD, VERMONT, U. S. A.



1855

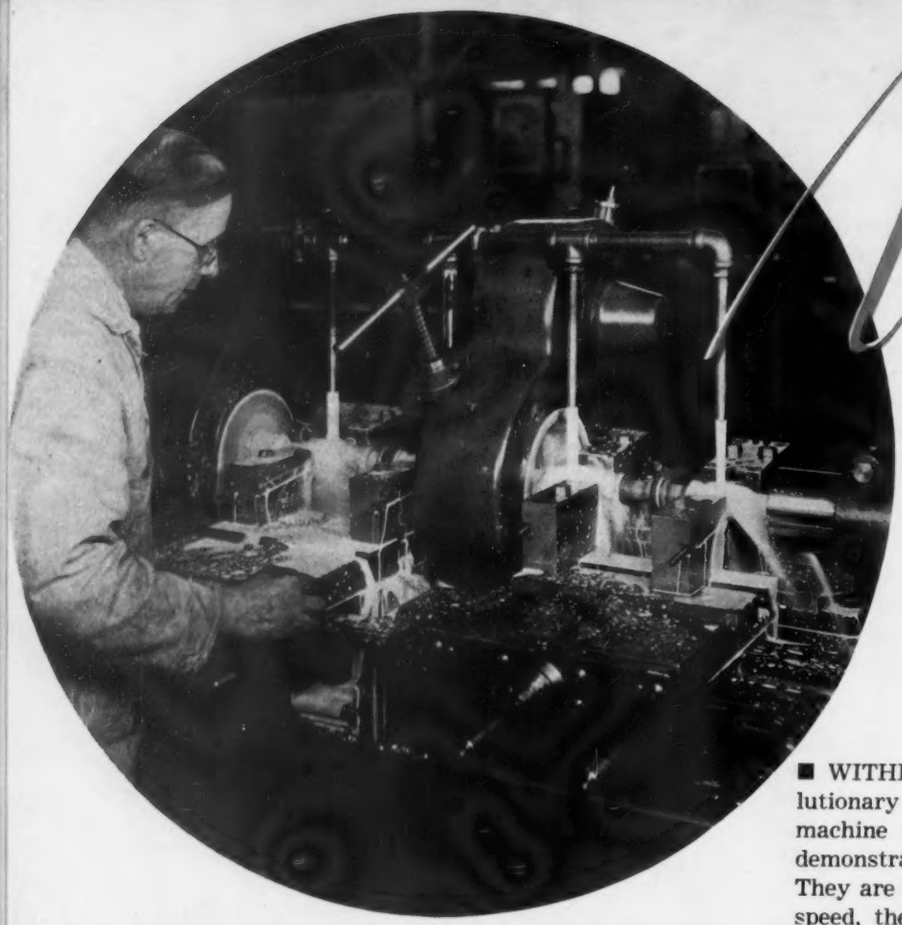
So far as known, this machine carried the world's first indexing turret

The record of more than a hundred years has accustomed men to look to Jones & Lamson today for machines to handle the tools of tomorrow . . .

For more than a hundred years, Jones & Lamson Machine Company, and its direct antecedents, have originated and developed an unbroken succession of major improvements in machine tool design and equipment. Today this organization continues to concentrate all its experience, resources and ingenuity on helping the metal working industry to earn new profits. To this end, modern Jones & Lamson machines embody more speed, power and rigidity than are combined in any other equipment of comparable size and capacity. Today you can protect, not only your present earnings, but your future profits by purchasing Jones & Lamson equipment to handle the tools of tomorrow.

MACHINE COMPANY

Manufacturers of Turret Lathes, Fay Automatic Lathes, Automatic Thread Grinding Machines, Comparators, Die Heads and Die Chasers.



Machine in circle, above, is a 10 x 34-inch Sunstrand automatic lathe equipped with "center drive" and tooled up for simultaneous turning of bearings of camshaft

Modern

Under

■ WITHIN the past 20 years there has been a revolutionary change in the internal setup of American machine tool plants. They are no longer museums demonstrating the longevity of machines of the past. They are now "operating exhibits" demonstrating the speed, the accuracy and convenience of operation of the machines of the present and in some cases even of the future.

No longer is there that old time hesitancy about conducting the visitor through these plants for fear that if he happens to be a prospective customer he will conclude that if the machine tool builder finds it possible to get along with 1898 model machine tools it still may be a bit too soon to replace a battery of 1906 models.

There is one big reason behind the general modernization of the machine tool industry. It is that modern tools are indispensable to machine tool builders in the building of the modern tools which in turn are indispensable to machine tool users. Only so long as industry in America was able to get along with "ordinary" tools, it was possible to build machine tools by the use of machine tools of past eras.

Machine tools are the only machines which are self perpetuating, but unless the breeding stock is renewed the quality begins to run out. In the machine tool industry what has happened within recent years has been—figuratively speaking—that the "breeding stock" has been renewed, and now constantly is being renewed. The result is that when a user buys a tool from any reputable builder today, he gets a "thoroughbred." He gets a machine which not only

Photograph at left is closeup of hinged type internal grinding attachment in use on Cincinnati 12 x 36-inch universal grinding machine. Attachment is simply swung up out of the way when doing regular cylindrical grinding with wheel on main spindle

Special Greenlee station-to-station horizontal machine, at right, drills long oil gallery holes, as well as all other holes in both ends of Studebaker Champion cylinder blocks at rate of 60 blocks per hour

Tools Indispensable

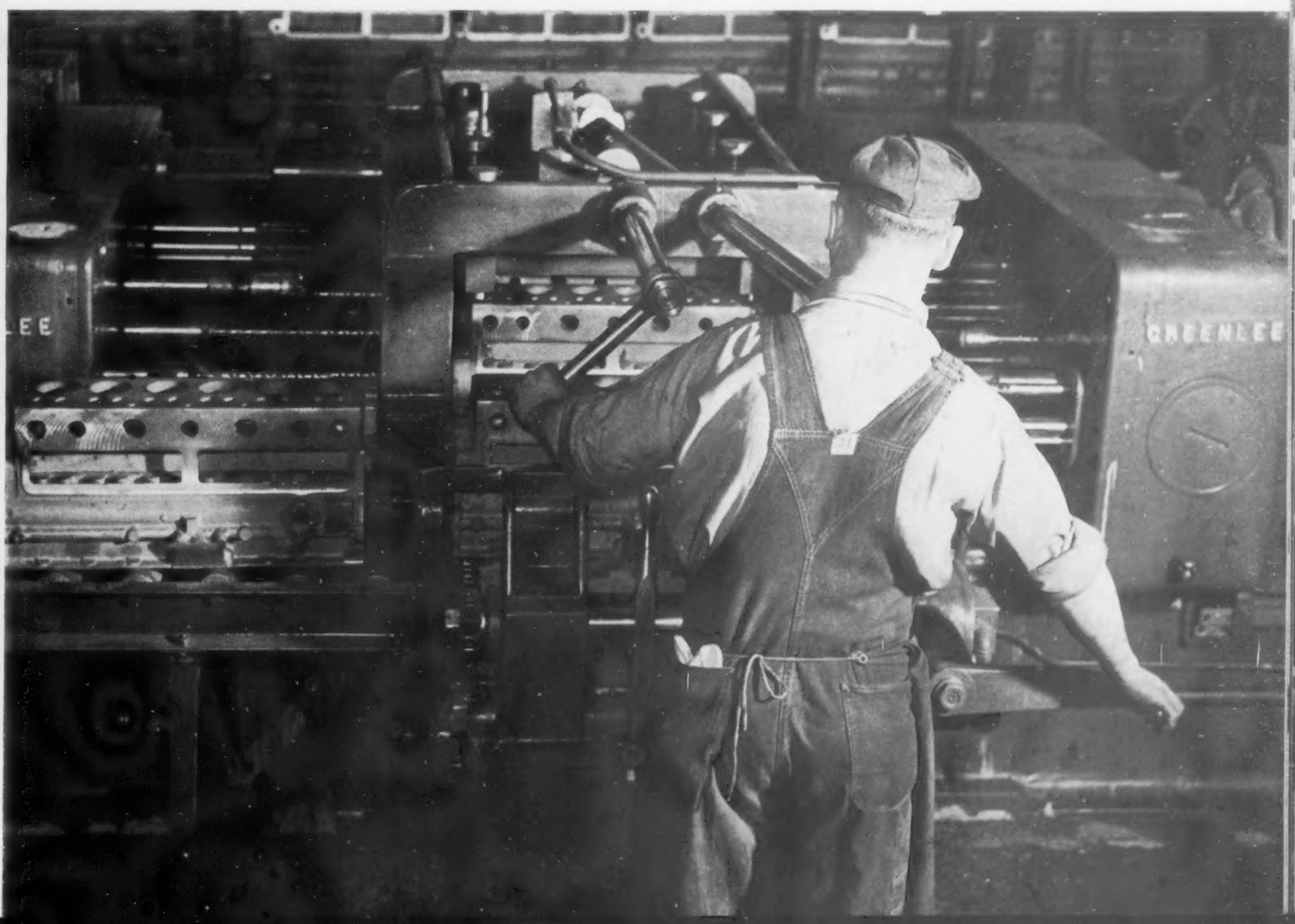
Modern Conditions

BY GUY HUBBARD
Machine Tool Editor

can keep pace with the production race today, but which has in it that extra stamina and speed which will enable it to meet the still swifter pace which is almost certain to be set by competition next month or next year. He gets a machine which also is a thoroughbred in appearance.

There are a great many reasons why modern machine tools are indispensable under modern conditions. It will be possible in this article to bring out only a few of the more important ones. One way to bring them out may be to "work backwards" from a manufactured product to the machine tools. So we will try that—using a mythical case history.

Suppose that a manufacturer of a simple type of pump decides to enter the field of manufacturing the mechanical units for a builder of domestic refrigerators. Pumps and these units should not be so different —so it would seem. Equipment good enough to build the pumps certainly should work out all right on the new units. There isn't a machine in the shop over



35 years old and they supposedly have been kept in good condition.

But when the drawings begin to come in from the refrigerator manufacturer, a number of surprises are in store. "What's all this about grinding cylinders to mirror finish to limits of plus or minus .0002-inch and with surface quality expressed in something called 'micro-inches'? What's the idea of this superfinish specification to ridiculous limits on pistons and piston rods? Then here's a part that certainly shouldn't call for diamond boring! And why attempt to surface grind these mating parts to insure gas tight joints? Why not use gaskets?"

And so the pump manufacturer—thinking that the designers and draftsmen have gone crazy—goes to the refrigerator manufacturer to find out what it is all about. He finds out to his surprise and consternation that there is a lot of difference between building a heavy, slow running mechanism which can easily be serviced at any time, and building a light, high speed mechanism which must function noiselessly and dependably, month after month with little or no attention on the part of the user.

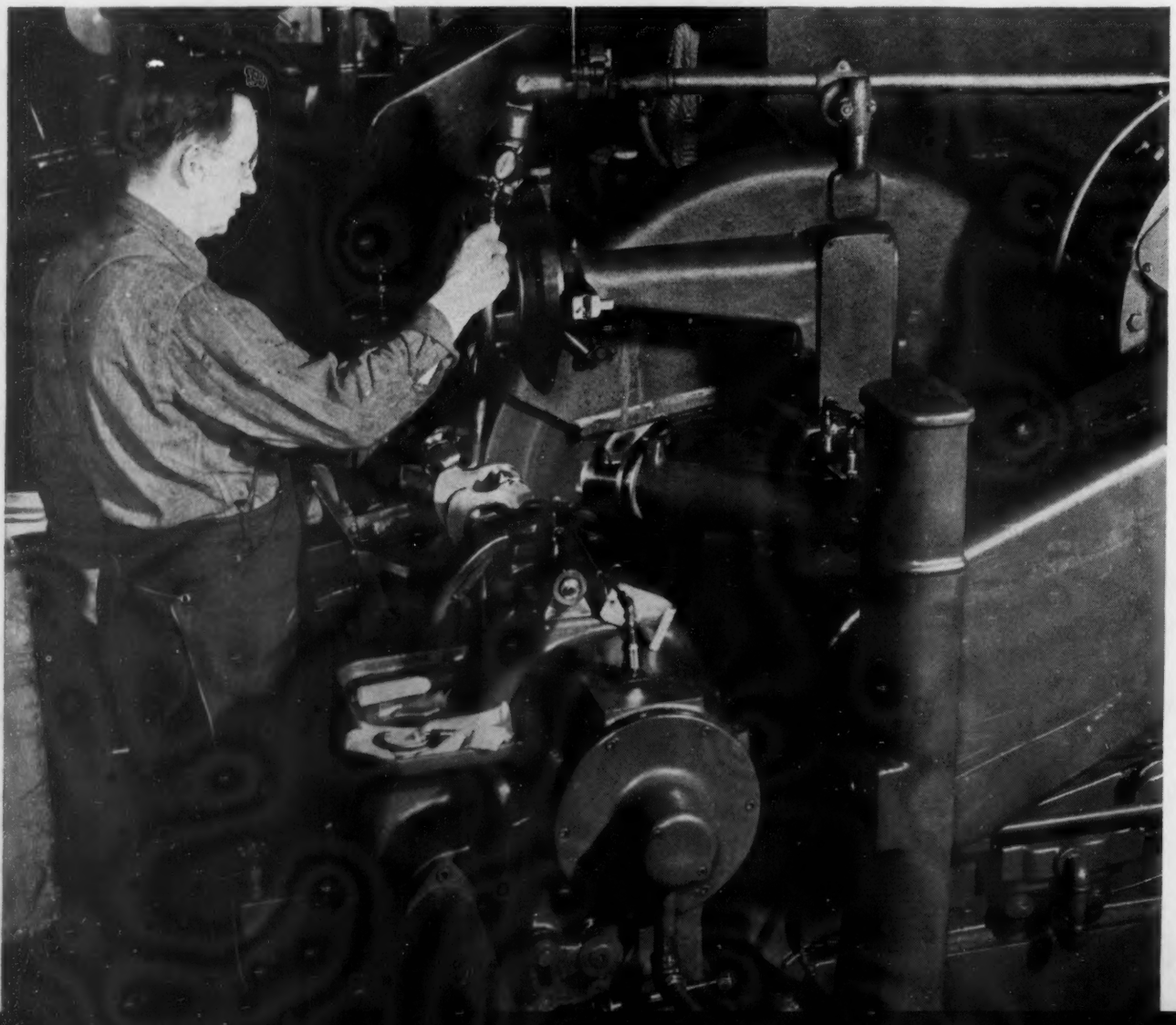
He would have found out the same thing if he had tackled a modern automotive unit, an electrical mechanism, a sewing machine, a vacuum cleaner or an aircraft engine. In any of these things he would run into new materials difficult to machine, new limits difficult to hold, new surface finishes difficult to attain—and production quantities which preclude trying to get around the situation by resorting to any hand finishing or toolroom expedients.

This manufacturer is faced with a problem. If he goes back to his traditional pump manufacturing, his days in business apparently are numbered because better equipped competitors are beginning to build better pumps and are taking his business away from him. If he goes ahead with this refrigerating unit project it seems obvious that his present equipment is worse than useless. Finally he decides to call in machine tool salesmen to have a talk with them about the whole situation.

Having had no active dealings with machine tool builders for many years, he is surprised to find that the salesmen are prepared to do a lot more for him than merely to try to unload some new machinery on him. They want to know all about the parts he is planning to make, what they are for, how many of each he is planning to make, every last detail as to material, limits and finish, and likewise the limits within which he must hold their cost.

He finds also that these modern salesmen have in mind much more than the bare machine tools—that their proposals include tools, jigs, fixtures and in some cases even conveyor and chip disposal equipment. He also finds that they are thinking beyond their own equipment to the extent of suggesting equipment of other makers for related and secondary

Show below is a Landis hydraulic crank pin grinder used in the Studebaker plant to finish grind all crank pin bearings on Champion crankshafts, and capable of handling seven shafts per hour



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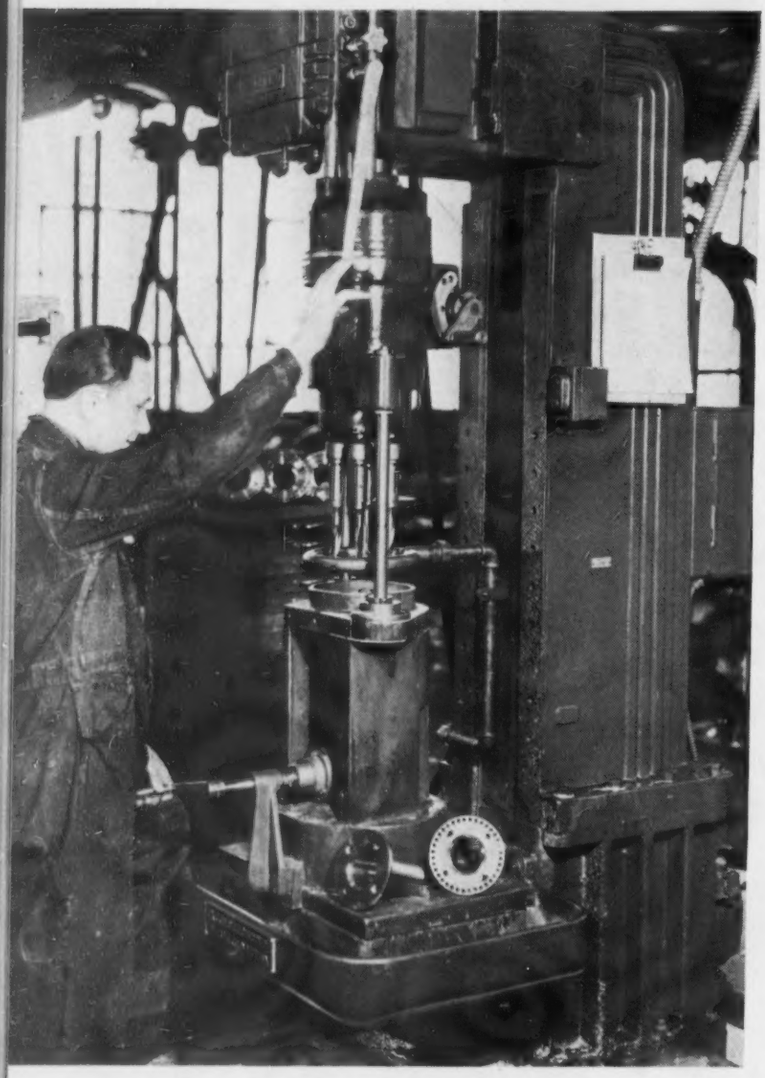
operations. They also make critical analyses of the rough parts to show how they can be redesigned for more effective machining without affecting the design of the finished parts.

This manufacturer had thought of the reorganization of his plant as representing tremendous sacrifices in two directions. First, in the scrapping of what seemed to him to be a lot of valuable equipment. Second, in heavy expenditures for new equipment.

When the machine tool sales engineers analyze his existing situation and present their proposals for the re-equipment, however, he finds that his thinking has been definitely wrong in both directions. In the first place, the old equipment, some of which perhaps can be made useful on minor operations through modernized tooling, is in most cases not an asset but a very serious liability—even if he goes on building his regular line. In the second place, the new equipment is not in the long run going to cost him anything. Actually—according to the plans and figures carefully worked out by these machine tool sales engineers—the guaranteed production of these new machines will make them pay for themselves well within their useful life—often in two to five years.



Special Ex-Cell-O machine shown above is used by Ampco Metal Inc., Milwaukee. Nine spindle head driven by hydraulic power unit is used with indexing fixture to drill 36 holes in flange of bronze propeller cone. Then head and fixture are changed to drill, countersink and counterbore four additional holes

Another surprise is the fact that with the new machines his proposed new undertaking will not require anywhere near the amount of manufacturing space that he had figured would be necessary. Elimination of cumbersome overhead drives make it possible to arrange the machines more effectively, and modern production speeds cut the number of new machines required, far below his original estimates.

Then there is the human problem. His existing force is made up for the most part of elderly workmen who had learned their trade and who through long practice have become familiar with the idiosyncrasies of the old and really seriously worn equipment which had been used for years on the old product. Thinking in terms of this type of staff and this equipment, it had looked to this manufacturer like a next to impossible task quickly to establish the proposed large additional force necessary.

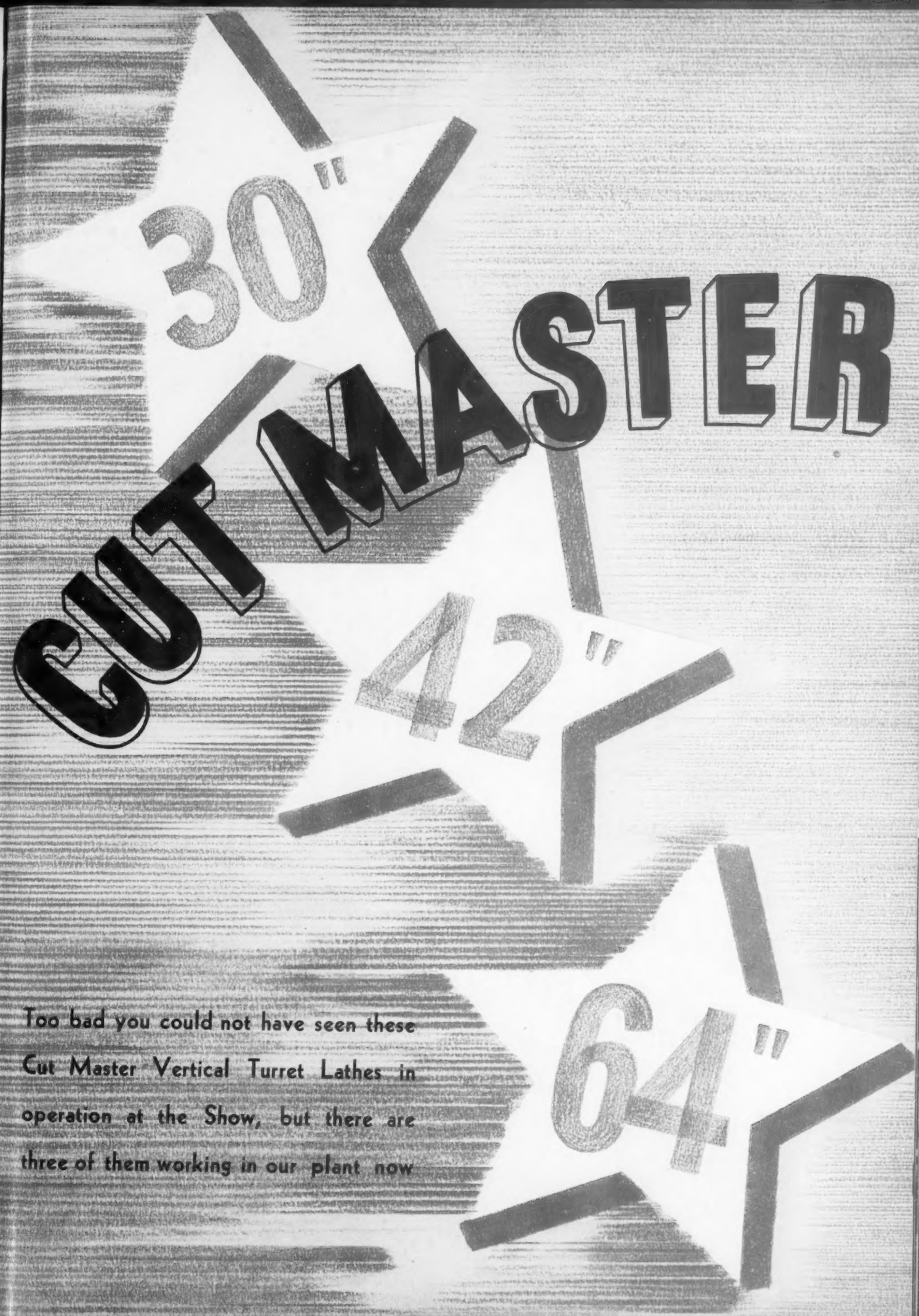
Modern Equipment Solves Personnel Problem

Here again he discovers that the new equipment will solve his problem. It has been designed with the thought in mind that it must be operated by those who have not had the advantages of long apprenticeship. Quick-change gear systems, or easily set hydraulic or electrical systems, control the speeds and feeds, and their indexes are plainly marked. Everything has been simplified as far as the manual operations are concerned, and controls are interlocked so that destructive faulty settings are impossible.

Micrometer dials are large and plainly marked, and because their settings can be depended upon, a great deal of hand calipering and other measuring is done away with. In some instances the machines actually correct their own settings so that the gaging and checking of the work is to a large extent eliminated. Thread grinders and certain other types of grinders have built-in wheel dressing mechanisms.

Not only has everything been simplified to make the operation of these highly refined machines just as simple as possible (we avoid the word "fool-proof" as an insult to the high average intelligence of American workmen today), but also the controls are arranged so as to reduce the physical effort to a minimum. Heavy operations such as moving large turrets and carriages into position is now done by power.

As in most mass production activities a bonus system is involved in connection with the refrigeration unit project which we have been considering in this article. The relationship between new equipment, the success of such a system and therefore the success of the whole manufacturing venture, is much closer than many industrialists realize. With old machine tools, the workmen are constantly handicapped by slipping drives, by hot bearings or by loose bearings, by inability to use the cutting tools to their maximum speed, by physical and mental letdown induced by unnecessary fatigue, and by failure of work to pass inspection because of the impossibility of "holding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42"
64"
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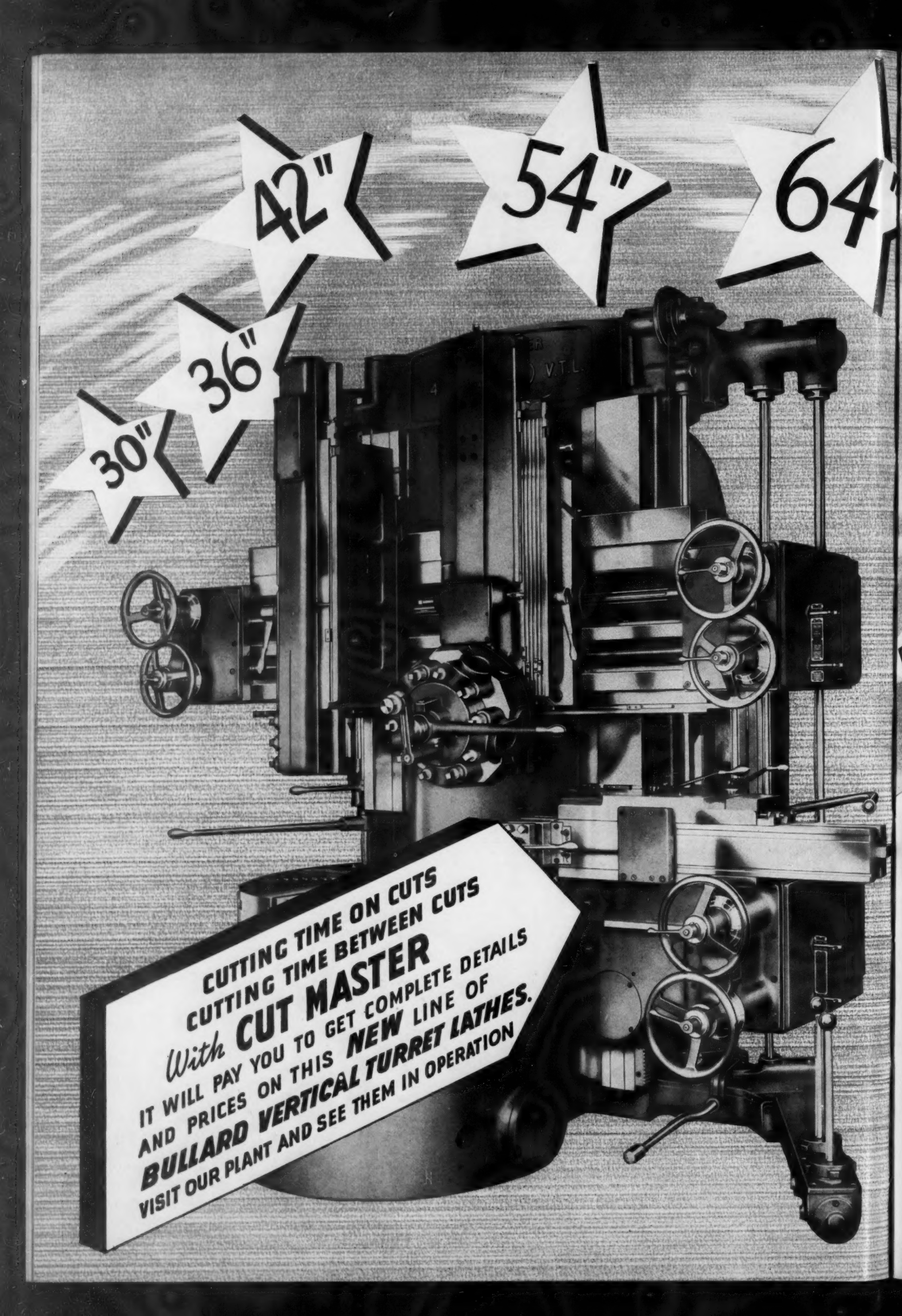
30"
36"
42"
54"
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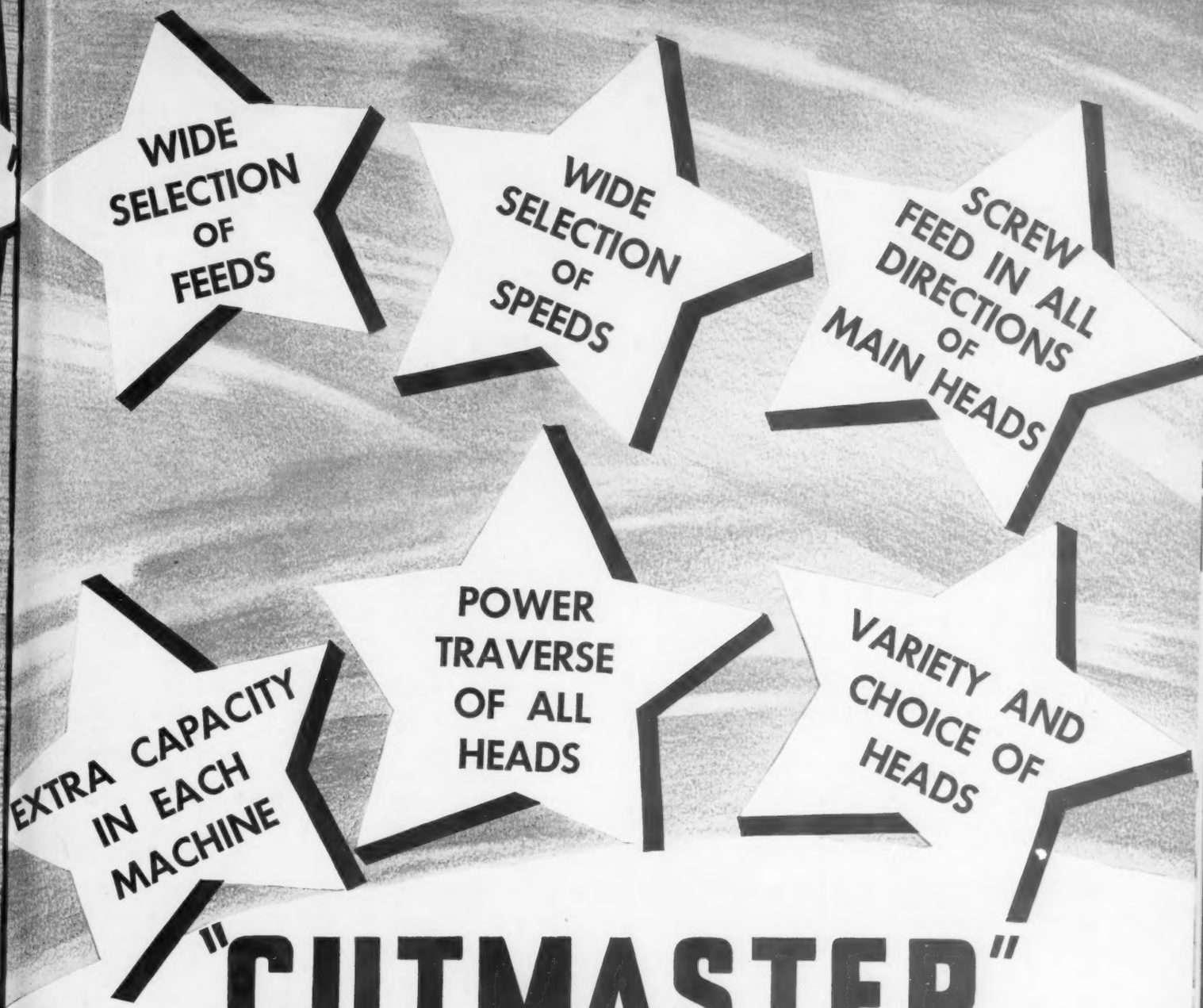
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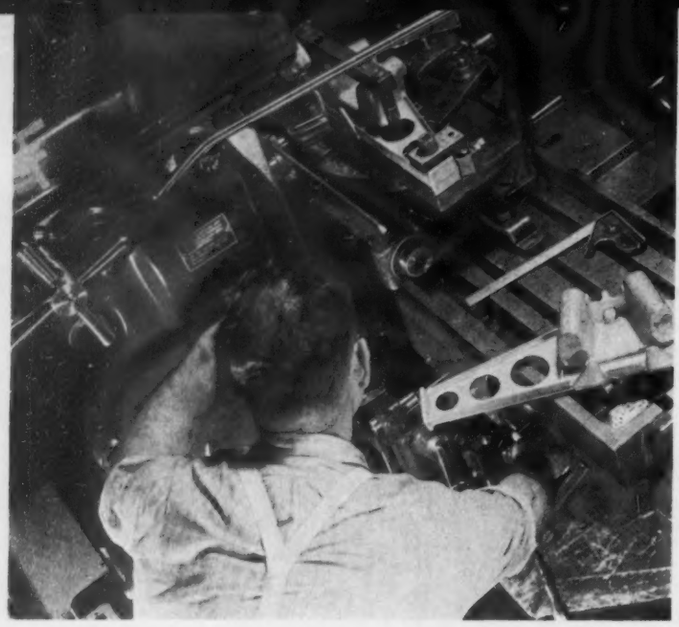

Cincinnati plain dial type milling machine, at left, in use in aircraft plant to mill pads on airplane truss. While nature of work requires that operator stand behind table, he is still able to retain full control of machine

settings" in the old worn machines full of backlash.

All these things, under a bonus system, conspire to hit the workman in his most sensitive spot—which is his pocket book. Failure, through no fault of his own, to earn his full bonus is to the workman equivalent to an unjustified cut in pay. He feels that his employer is deliberately penalizing him by making him use an inadequate piece of equipment. The workman doesn't stop to consider that the employer is also penalizing himself, and apparently the employer doesn't consider that point either. If he did he would install the new equipment regardless of his attitude toward his workmen, because his pocket book likewise is a very vital spot.

In these days the labor implications of new machine tool equipment are not to be taken lightly. If this refrigerator unit manufacturer, or any other industrialist involved in interchangeable manufacturing, wants to hold his good workman to attract other good workmen, and to enjoy the very real advantages of a loyal organization, there is no surer way to do it than through the logical use of modern machine tools and modern tooling.

By logical use, we mean the prompt sweeping out of accumulations of old equipment such as we have pictured in the story running through this article, and thereafter by making replacements just as rapidly as new machine tool developments and new products to be made, make the existing equipment uneconomical and a labor liability.

Earlier in this article we referred to new model machine tools as "thoroughbreds." We meant exactly what we said, having been privileged to see many of them being "groomed for showing" during recent months. And now, on the pages following, we are able to present to our readers this actual "showing" of recent accomplishments of the American machine tool industry. Modern tools—indispensable under modern conditions!

Operation depicted below is machining of bearing support bushings used on cam and balancing shafts of diesel engines. Gisholt ram type universal turret lathe is efficiently equipped for this job entirely through use of standard tools and tool holders—thus holding tooling cost to minimum

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With war in Europe and in the Orient, with disturbed conditions in many countries and with uncertainty existing as to how far the present conflagration may extend in the future, the world is turning more and more to the United States for goods and services.

Of all industrial nations, the United States is best prepared to assume this extraordinary responsibility because it is the master of the master tools of industry. It is everywhere recognized as the leading builder of machine tools and allied equipment so essential to economical production of many necessities whether under peacetime or wartime conditions.

Now as never before in history, the tremendous burden of supplying the civilized world with every variety of modern industrial equipment rests largely on the shoulders of American industry. Now it is more important than ever before that every individual concerned with production should know exactly what the machine tool industry means to our country and to the world in this present situation.

In the following pages, STEEL presents a remarkable picture of the present high state of development of American machine tools and accessories. Here is presented the exceptionally fine equipment with which America is prepared to meet the challenge of this emergency.

Active times and great responsibilities are ahead. The American machine tool industry is ready for them!

—The Editors

Why America

Of The Master Tools

■ The "Master Tools of Industry"—regardless of whether peace or war is the prevailing condition—are machine tools. Any country which holds a commanding position in the design, manufacture and use of machine tools, and which at the same time has within its own well-protected borders rich stores of diversified raw materials, is in a most enviable position under any conditions—especially so in the gravely troubled world of today. The United States has been in that fortunate position for a long time.

Our country attained mastery of the master tools of industry through a fortunate combination of circumstances. The basis for the whole thing lay in the early and rapid development of mechanical skill and ingenuity among the American people.

Because of their almost complete isolation from the distant industrial centers of Europe, our pioneers had to make things for themselves—or go without. Had they been content to go without, or had they been without the initiative and "will to work" demanded in the solution of new and difficult problems, they or their fathers would not have pulled up stakes in Europe to migrate to America.

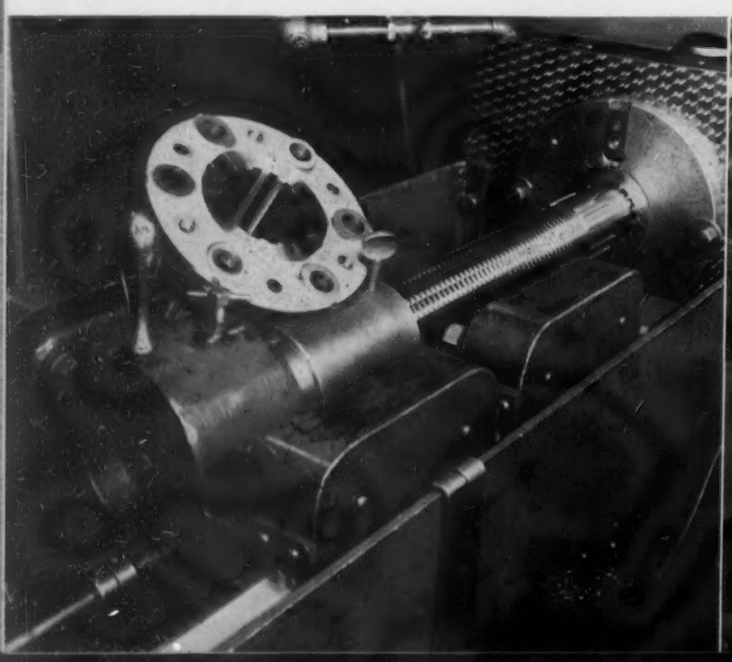
Blessed with active minds and plenty of physical energy, and literally surrounded by raw materials—great trees waiting to be chopped down and worked up into houses and furniture, deposits of "bog ore" waiting to be dug, smelted by charcoal and cast into the form of kettles, fireplace fittings, etc.—the American pioneers were not long in taking advantage of their industrial opportunities. Neither the hard work involved nor restrictive laws imposed by short-sighted rulers thousands of miles away, deterred them from making for themselves, first the necessities of life, and then step by step such luxuries as Franklin stoves and carriages with spring suspension.

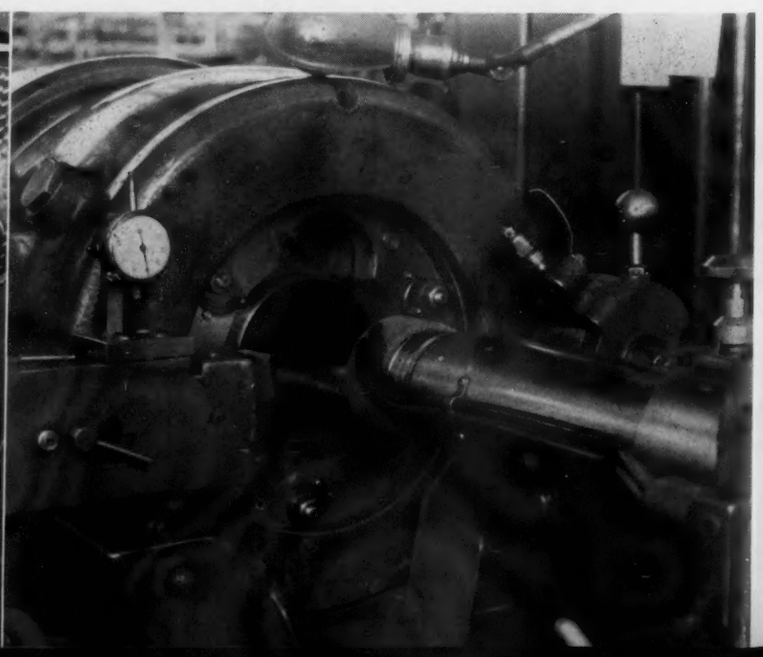
Before "things" can be made, "tools" must be made to make them. The earliest axes, saws and auger bits used in the American wilderness were brought over from Europe. Beyond that however, and aside from importations of tool steel which did continue for many years, Americans to a large degree managed to "go it alone"—making their own tools to their own original, decidedly practical and highly ingenious designs.

There is a definite connection between our demo-

Lapointe broaching machine, at left, cuts internal splines in reduction gear hubs of Pratt & Whitney aircraft engines, to limits of .0002-inch

Setup directly below shows how bores of Pratt & Whitney aircraft engine cylinders are finished, after nitriding operation, by use of Bryant chucking grinder





is Master

Of Industry

Action photograph, above, depicts machining of 2¼-inch round collet from 3120 unannealed hot rolled steel, in Gisholt machine with cross feeding turret. Same machine and same simple standard tools (excepting drills) are used effectively on other collets ranging from 2 to 8 inches

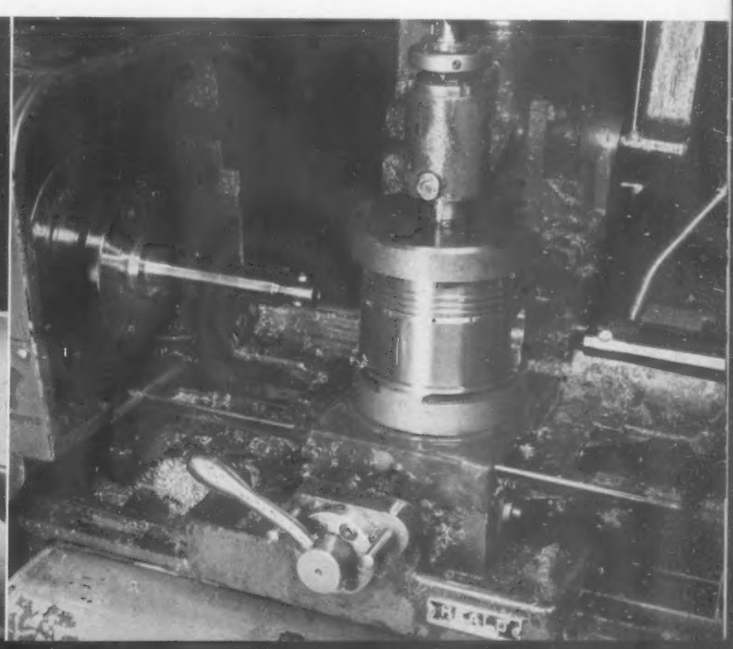
cratic form of government and mechanization of industry in this country. Throughout the centuries great minds in the Old World had envisioned both these ideals and their tremendous possibilities. Most of these men however, were abstract thinkers who lacked power to materialize their thoughts. Those few who did have the energy and courage to act on their ideas were very promptly put out of business; by dynastic governments if they were political reformers; or—in the case of several early advocates of the machine—by blind opposition on the part of workmen who looked upon machines as "hated rivals."

Thomas Jefferson brought back from Europe not only some rather startling political ideas, but also the seeds of the interchangeable system of manufacturing. In 1785, while serving as United States Minister to France, he became keenly interested in the efforts of the French gunsmith LeBlanc to manufacture muskets interchangeably. LeBlanc's system, to quote from a letter written by Jefferson to John Jay at that time, "—consists in the making of every part of them so exactly alike, that what belongs to any one, may be used for every other musket in the magazine."

A number of years later, Jefferson wrote to James

Shown directly below is auxiliary second operation unit on new Cleveland single spindle automatic, arranged for milling slot in rear of piece after cutting off

Special Heald borematic, at right below, uses tungsten carbide and c diamond to "mirror finish" wristpin holes in forged aluminum pistons of Pratt & Whitney engines holding .0002-inch limits



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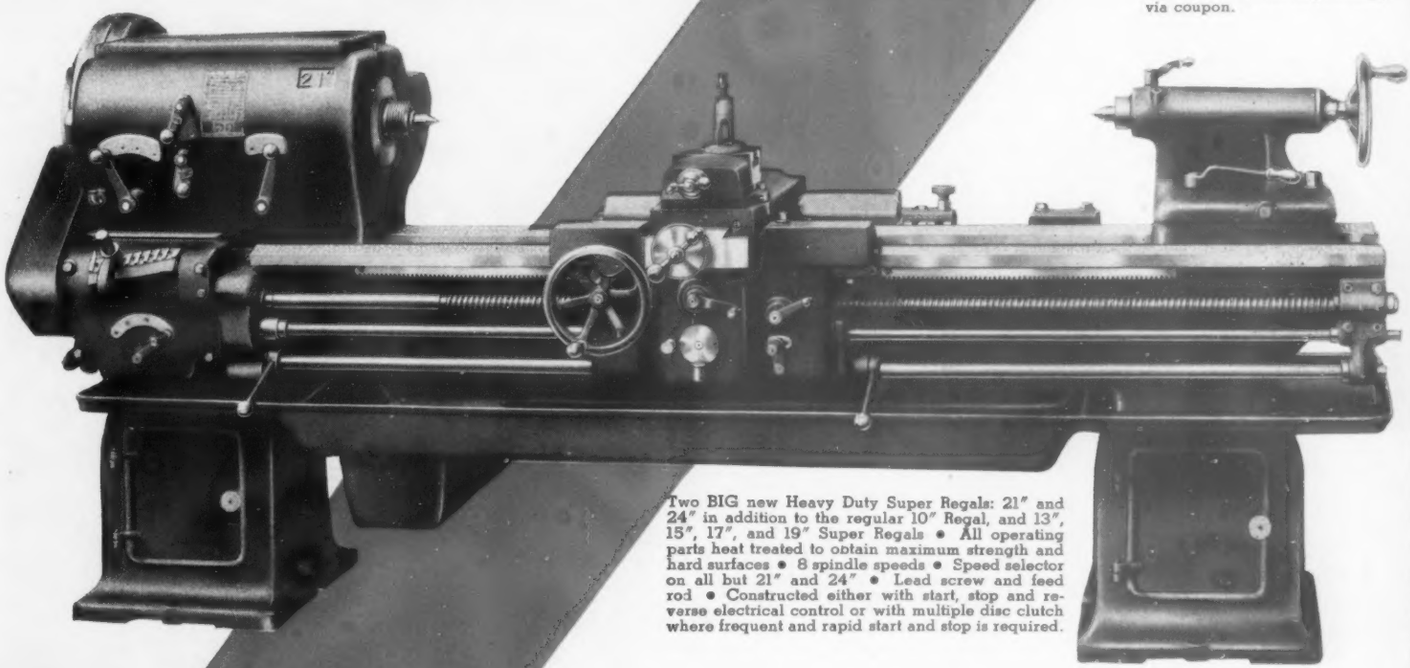
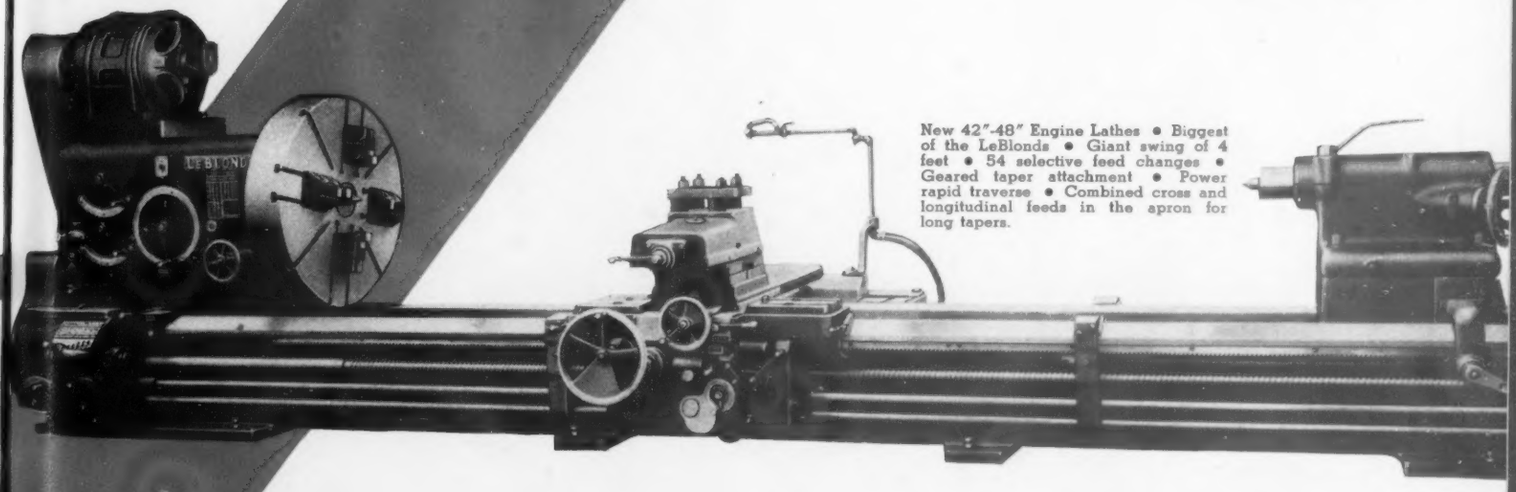


Two BIG new Heavy Duty Super Regals: 21" and 24" in addition to the regular 10" Regal, and 13", 15", 17", and 19" Super Regals • All operating parts heat treated to obtain maximum strength and hard surfaces • 8 spindle speeds • Speed selector on all but 21" and 24" • Lead screw and feed rod • Constructed either with start, stop and reverse electrical control or with multiple disc clutch where frequent and rapid start and stop is required.



New 42"-48" Engine Lathes • Biggest of the LeBlonds • Giant swing of 4 feet • 54 selective feed changes • Geared taper attachment • Power rapid traverse • Combined cross and longitudinal feeds in the apron for long tapers.

Monroe regarding LeBlanc: "I endeavored to get the U. S. to bring him over, which he was ready for on moderate terms. I failed and I do not know what became of him."

Fortunately, when Thomas Jefferson got hold of a good idea—whether political, economic or industrial—he did not drop it just because he encountered official opposition or bureaucratic indifference. After his return to the United States he became acquainted with the young and brilliant American inventor Eli Whitney and Whitney became a Jefferson protege.

In 1798, Eli Whitney was awarded a contract by the United States government for the manufacture of 15,000 muskets on "a new principle." What he aimed to do, he explained, was "— — to make the same parts of different guns, as the locks for example, as much like each other as the successive impressions of a copper-plate engraving." That Whitney "had everything that LeBlanc had"—and more—is indicated by the following passage from a letter which his patron Jefferson—by that time President of the United States—wrote to James Monroe in 1801: "He (Whitney) has invented molds and machines for making all the pieces of his locks so exactly equal, that take 100 locks to pieces and mingle their parts and the 100 locks may be put together by taking the pieces which come to hand."

Before Eli Whitney could turn out these interchangeable muskets in quantity it was necessary for him to build an armory on a waterpower site at Whitneyville, in the outskirts of New Haven, Conn. More important and more difficult than that, he had to design and build all of the new types of jigs, fixtures, tools, gages and *machine tools* on which the success of his system depended. Aside from what little he may have learned from Jefferson of LeBlanc's methods and machinery, Whitney had no precedents to follow—he had to create "out of thin air."

All this took time, several years in fact. During that waiting period the United States Government advanced large sums of money to Whitney despite the fact that no deliveries were being made and in the face of the even more disconcerting circumstance that Whitney's system was ridiculed by famous French and English ordnance experts.

Throughout those critical years, which coincided with Jefferson's two terms as President of the United States (1801-1809), the author of the Declaration of Independence continued to back Whitney right up to the hilt. In that respect this "Founding Father" demonstrated a faith in machinery and in private industrial enterprise which some of his political heirs failed to emulate about 135 years later.

Jefferson's faith in Whitney, in Whitney's system of manufacturing, and in Whitney's machinery and tools, was thoroughly justified. The government received its muskets within the contract period and at the contract price. Their quality was so high that further contracts immediately were placed.

Through the medium of apprentices and journeymen who "graduated" from the Whitney armory, the

Chrysler pistons being loaded into Foster superfinishing machine, by which quality of peripheral surfaces is brought within a few microinches of absolute smoothness

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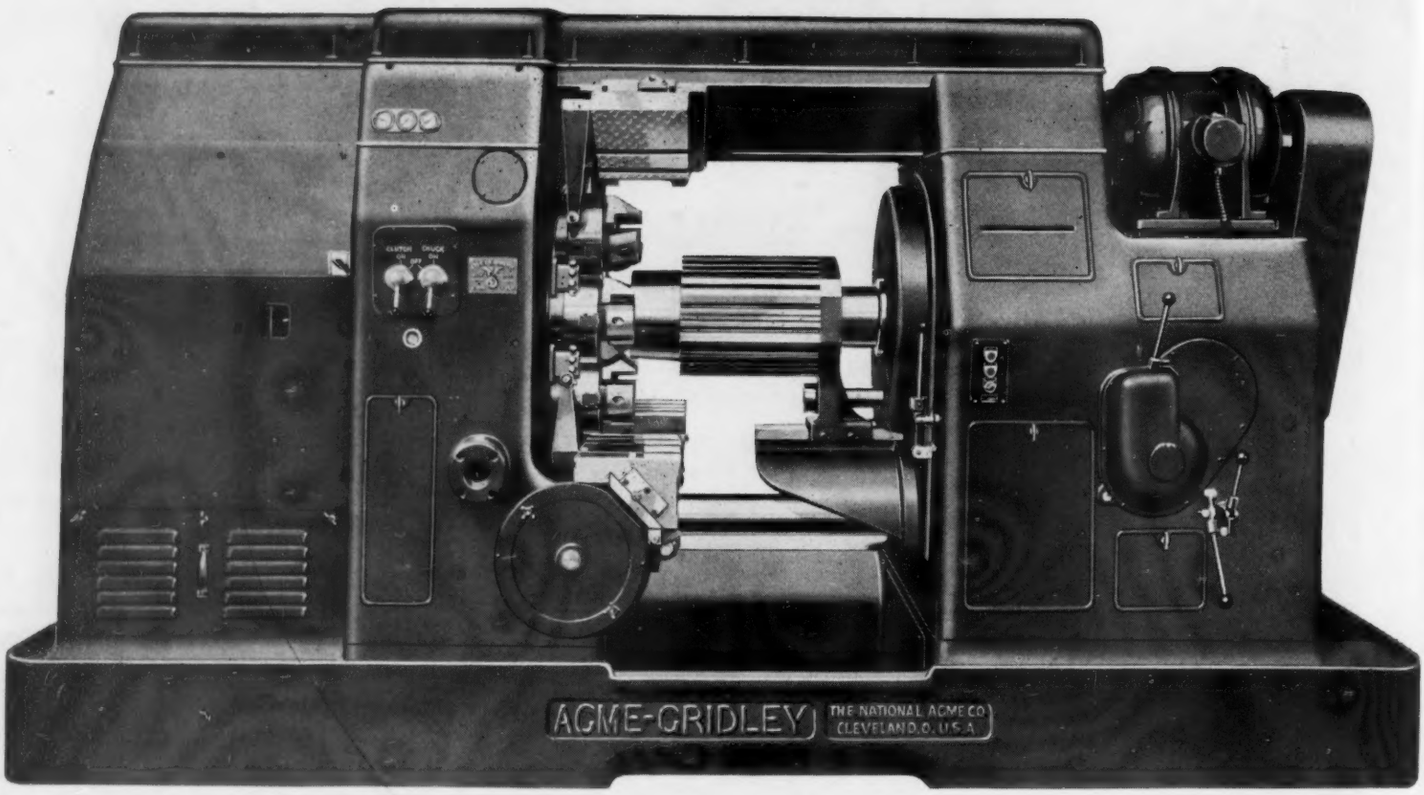
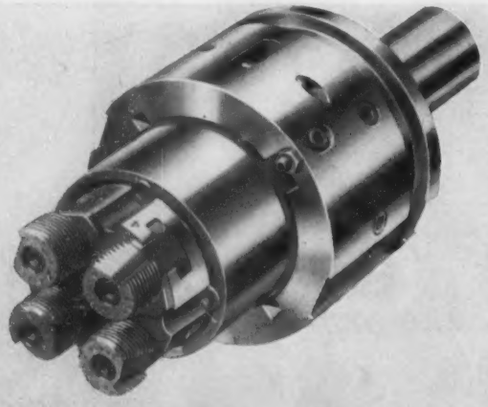
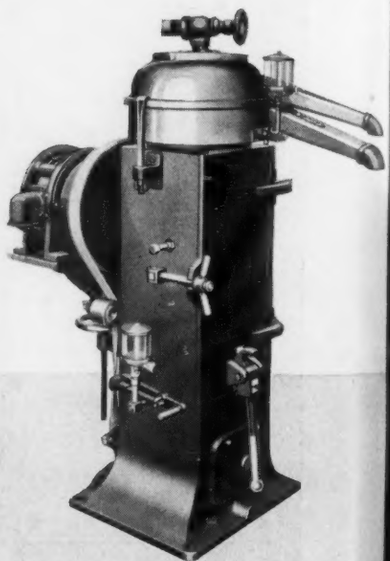
THE National Acme Show



• The *12-inch* 6 Spindle Chucking machine with mechanical speeds and feeds and full hydraulic chuck operation. The new Acme-Gridley 4-6 and 8 spindle chuckers are stepping up production as much as 5 times over former methods employed—sizes 4⅝ to 12".



Namco Circular Chaser Dies, and Collapsing taps — favored tools for production threading jobs. Circular chasers give 10 times the life of ordinary kind. See these economy tools — for every threading job.



Positive Centrifuge — for oil reconditioning, quickly pays for itself in protecting machine life and cost savings for cutting, quenching, hydraulic or soluble oils. See it work.

...in Print...

✓ New Designs

✓ New Performance

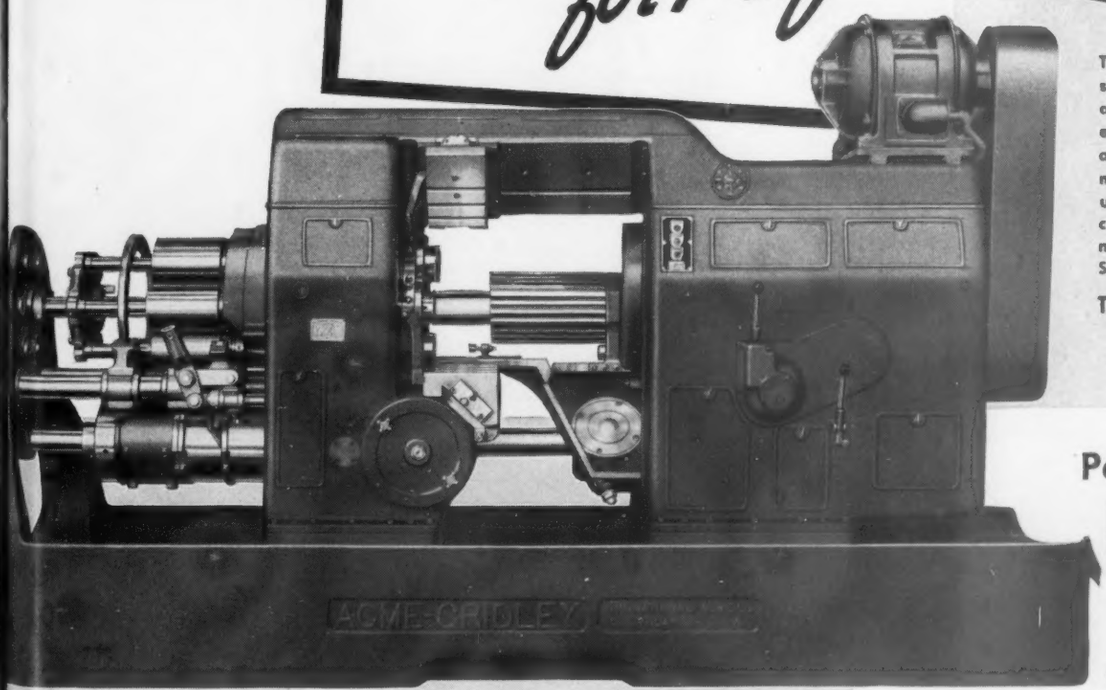
✓ New Opportunities for Profit

Vertical Tapping and Boring machines—for work 2" to 4½", featuring an indexing work holding chuck which results in positive alignment of taper bores and threads with high accuracy at record speeds. Step up and gauge them yourself.

The Chronolog—shows why, when and how long any equipment is idle, and gives an accumulated count of units produced. Increases production more than 10%. See them in action.

Snap-Lock Switch—adopted as standard equipment by many machine tool builders as the most dependable switch ever used for both heavy and light duty normal circuit work. Test one yourself.

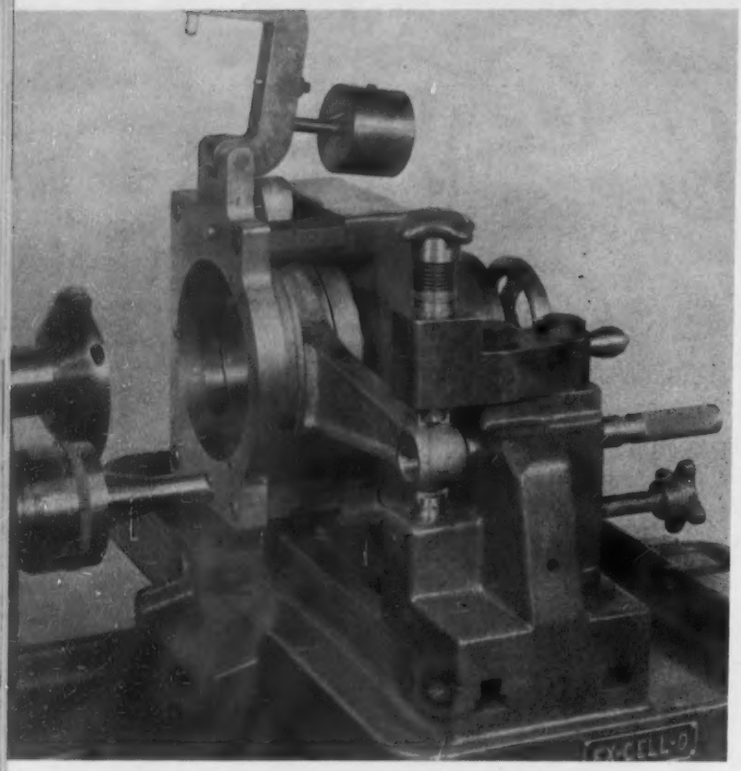
THE NATIONAL ACME COMPANY
Cleveland, Ohio



Acme-Gridley 4-6 and 8 Spindle Bar Automatics demonstrating high tolerances at speeds and feeds as fast as modern cutting tools can withstand. Check speed and accuracy under power.

Postponement of the MACHINE TOOL SHOW

emphasizes more than ever the necessity for MODERNIZING. Ask for the new catalogs on all this equipment you planned to witness.



Adjustable two-spindle Ex-Cell-O machine, above, is equipped with special fixtures which hold various sizes of eccentric straps whose large and small end are finish bored simultaneously from the two spindles

new manufacturing technique and novel equipment which made it possible, rapidly became known to other American manufacturers. As a result, numerous Yankee mechanics soon were busily engaged in enlarging the scope of Whitney's system, and in designing and building a wide variety of machine tools to meet the rapidly growing demands of interchangeable manufacturing. That task has never been completed and never will be as long as the design for living called the "American Way" endures. Today—more than one hundred years later—direct successors to those old time Yankee mechanics in more than 200 well equipped shops located not only in New England but also in the great midwestern industrial region which has developed and assumed vital importance since Whitney's time, are still busily engaged in designing, building and tooling up thousands of machine tools of almost endless variety, to meet the still growing needs and insistent demands of interchangeable manufacturing—now commonly called "mass production."

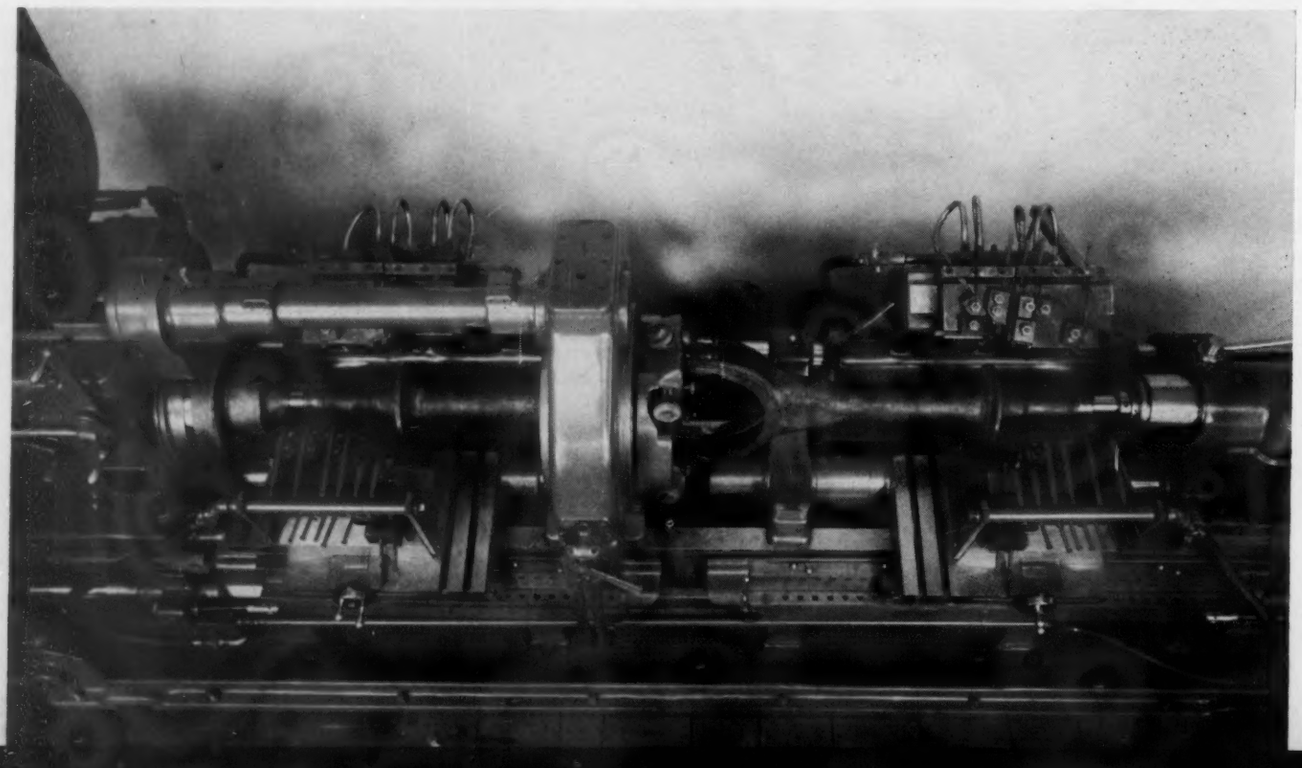
In view of the ridicule of Eli Whitney's methods by European ordnance experts, and in view also of the fact that certain basic machine tools actually had reached a fair state of perfection in England prior to their independent development here in America, here is a bit of history worth remembering.

In 1853 a Royal commission was appointed to reorganize the Small Arms Manufactory at Enfield, England. The mainspring of this commission was James Nasmyth, one of England's outstanding machine tool and ordnance experts. After careful consideration and visits by members of the Royal commission to the leading industrial plants in the United States, it was resolved to introduce the American system at the Enfield armory, this being in line with Nasmyth's original recommendations.

Thereupon the British government placed orders with American machine tool builders for practically all the equipment required to manufacture Enfield rifles under the system established by Whitney fifty years before. Several hundred machine tools, together with jigs, fixtures and gages, were covered by these orders. But that was only the beginning. Within the next few years practically every government in Europe was involved in a scramble to adopt the American methods and to obtain American machine tools. And that rush is still on!

While the conclusion may be drawn from this

Below is a closeup of typical setup for machining both ends of long, heavy shafts, etc. in Jones & Lamson Fay automatic lathe. Truck axle housing shown is mounted between centers but is revolved by fixture in center drive attachment



"MODERN" MEANS MORE THAN MERELY "NEW" IN THE DESIGN OF MILWAUKEE MILLING MACHINES

CHANGES and developments in milling machine design must be more than merely "new" to measure up to the K&T concept of what is "modern" . . . If the "new" offers definite improvements in performance — proven by exacting tests on actual work — K&T engineers pass on these benefits to milling machine users . . . Only by such careful analysis and practical tests can basic progress in milling machine design be made . . . Concentrating on the building of milling machines exclusively—for more than 41 years—has won for the Kearney & Trecker Corp. world-wide recognition for the most advanced milling machine design and construction.

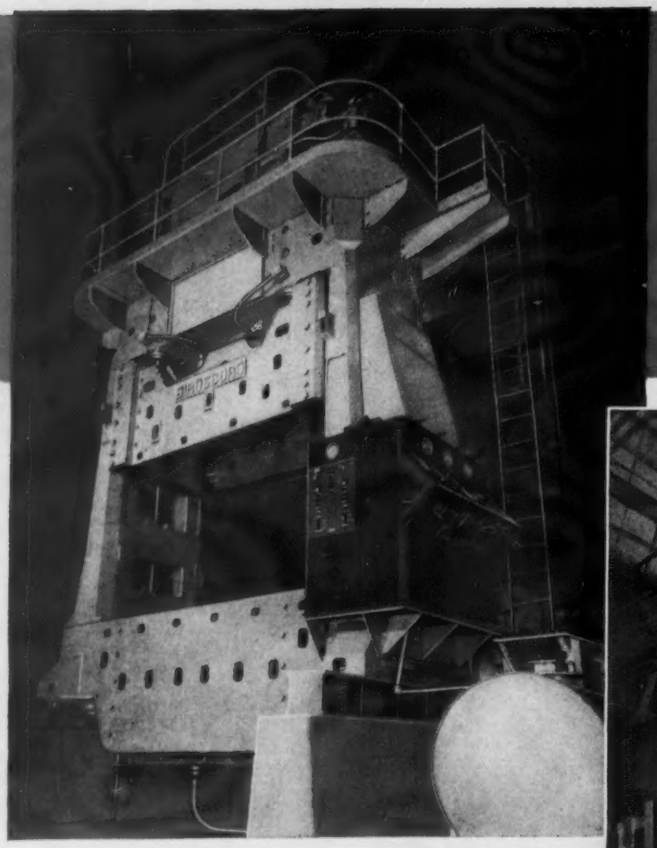
KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U. S. A.

PROFIT MORE WITH K&T PRODUCTS

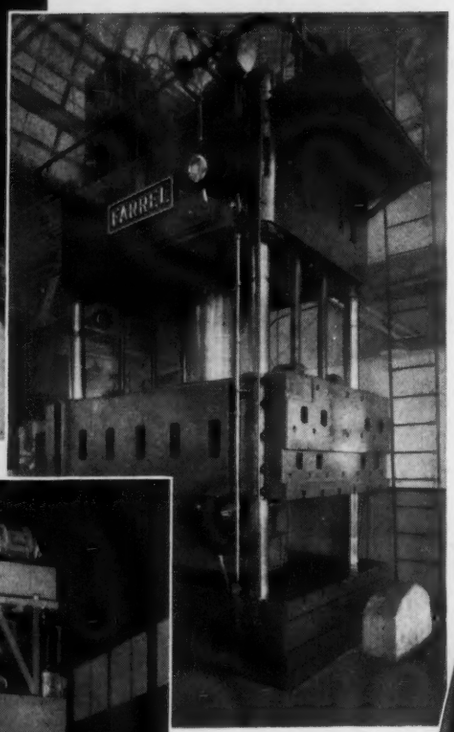
K&T

Milwaukee **MILLING MACHINES**

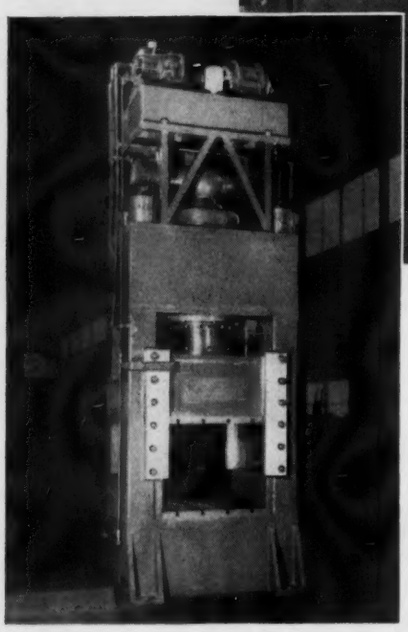
PRESTIGE



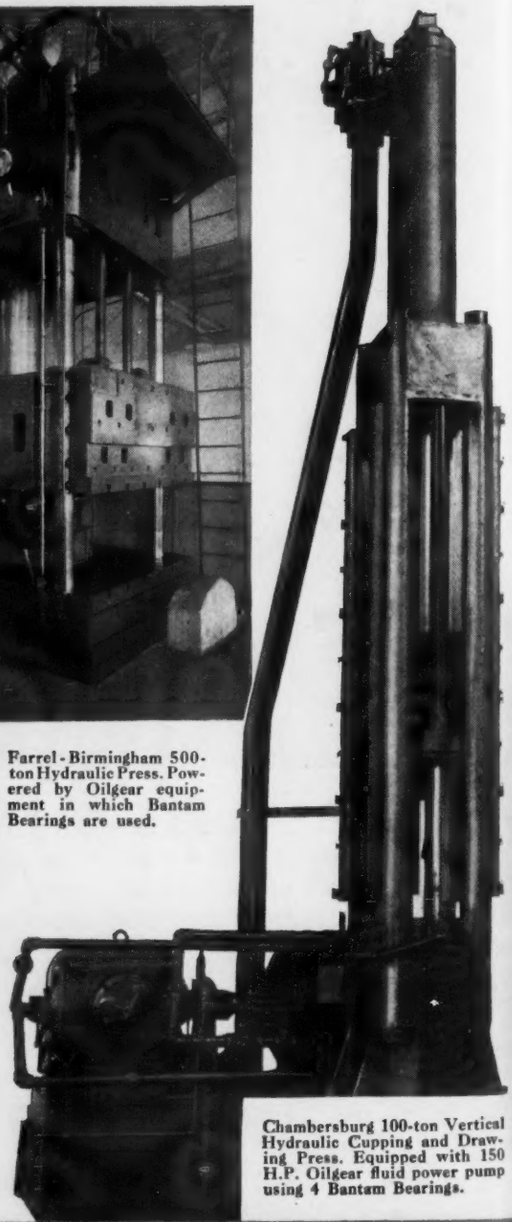
Birdsboro 550-ton Hydraulic Press for forming large automobile and airplane parts. Equipped with Oilgear fluid power feeds, using Bantam Bearings.



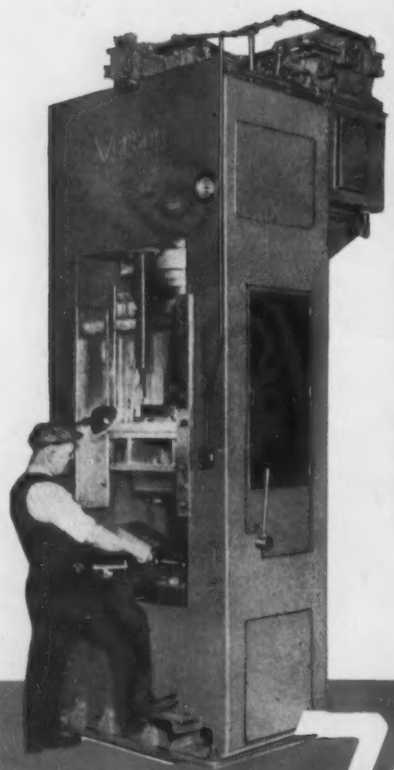
Farrel-Birmingham 500-ton Hydraulic Press. Powered by Oilgear equipment in which Bantam Bearings are used.



Beatty 750-ton Hydraulic Straightening Press. Equipped with Oilgear fluid power pump, using Bantam Bearings.



Chambersburg 100-ton Vertical Hydraulic Cupping and Drawing Press. Equipped with 150 H.P. Oilgear fluid power pump using 4 Bantam Bearings.



Vernon 150-ton Hydraulic Speed Press. Operated by Bantam Bearing equipped Oilgear power pump.

YOU CAN RELY ON

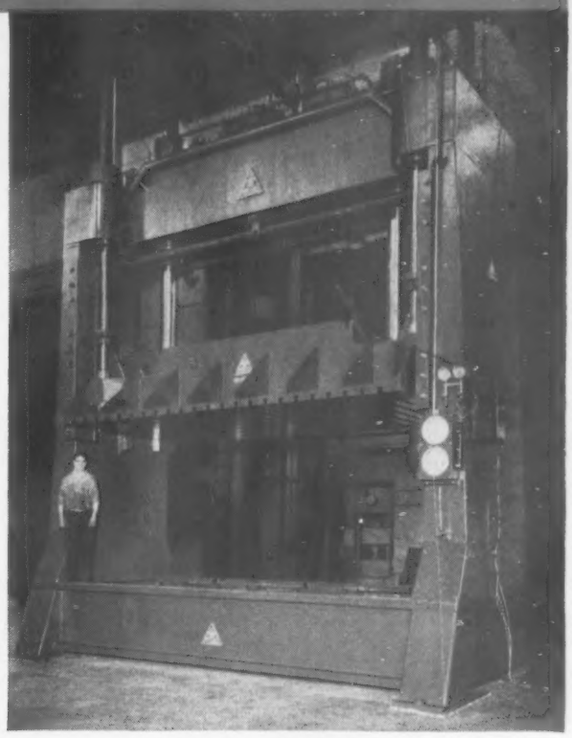
SAFEGUARDED *by* A GOOD BEARING

EACH of the manufacturers of these huge production machines has built up tremendous prestige based on impressive records of dependable performance. One of their greatest problems was to provide perfect power control, and each has solved it completely by the use of OILGEAR fluid power pumps, equipped with Bantam Bearings.

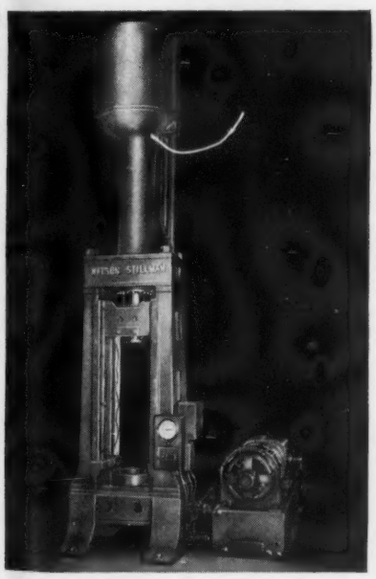
Where power requirements are most exacting . . . where replacements are difficult . . . where stamina and durability are essential — Bantam Bearings are gaining ever greater preference because of their performance records on the most difficult jobs.

Bantam makes *three distinct types* of bearings — to better solve your every bearing problem.

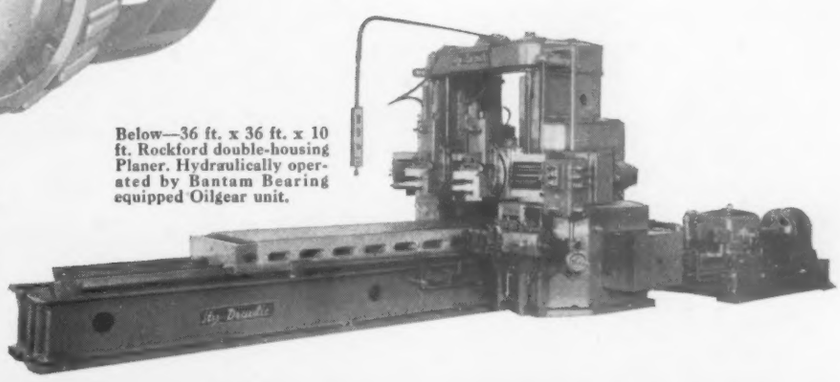
BANTAM BEARINGS CORPORATION
SOUTH BEND, INDIANA
Subsidiary of THE TORRINGTON CO., Torrington, Conn.



Above—Clearing 50-ton Hydraulic Die Spotting Press. Powered by an Oilgear unit—Bantam Bearing equipped.

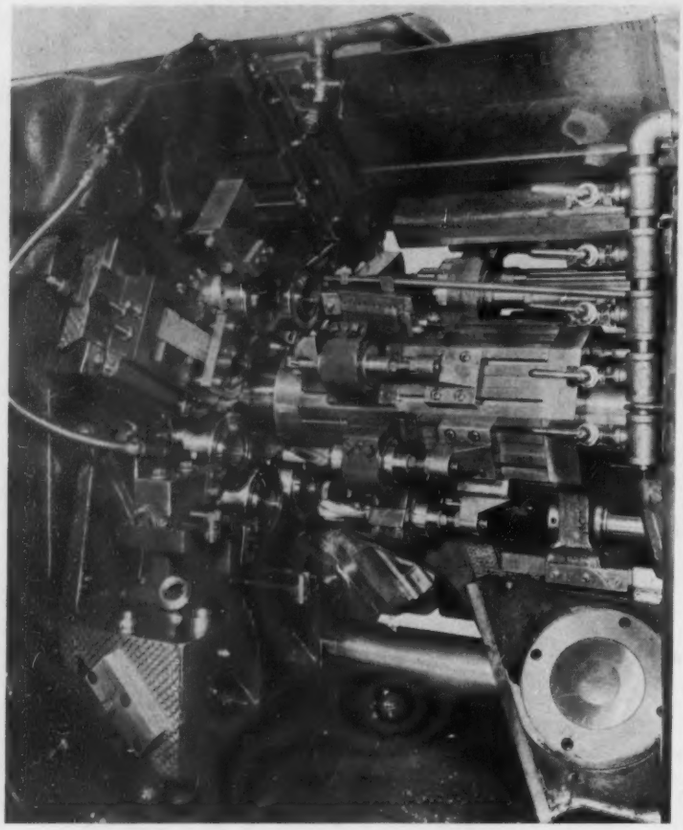


At left—Watson-Stillman 200-ton Single Action Drawing Press, operated by Oilgear DX-15025 pump —Bantam Bearing equipped.



Below—36 ft. x 36 ft. x 10 ft. Rockford double-housing Planer. Hydraulically operated by Bantam Bearing equipped Oilgear unit.

BANTAM BEARINGS
TAPERED ROLLER •• STRAIGHT ROLLER •• BALL



Photograph above reveals details on front side of Acme-Gridley 8-spindle automatic bar machine when tooled up for quantity production of bevel blanks shown on cross slide

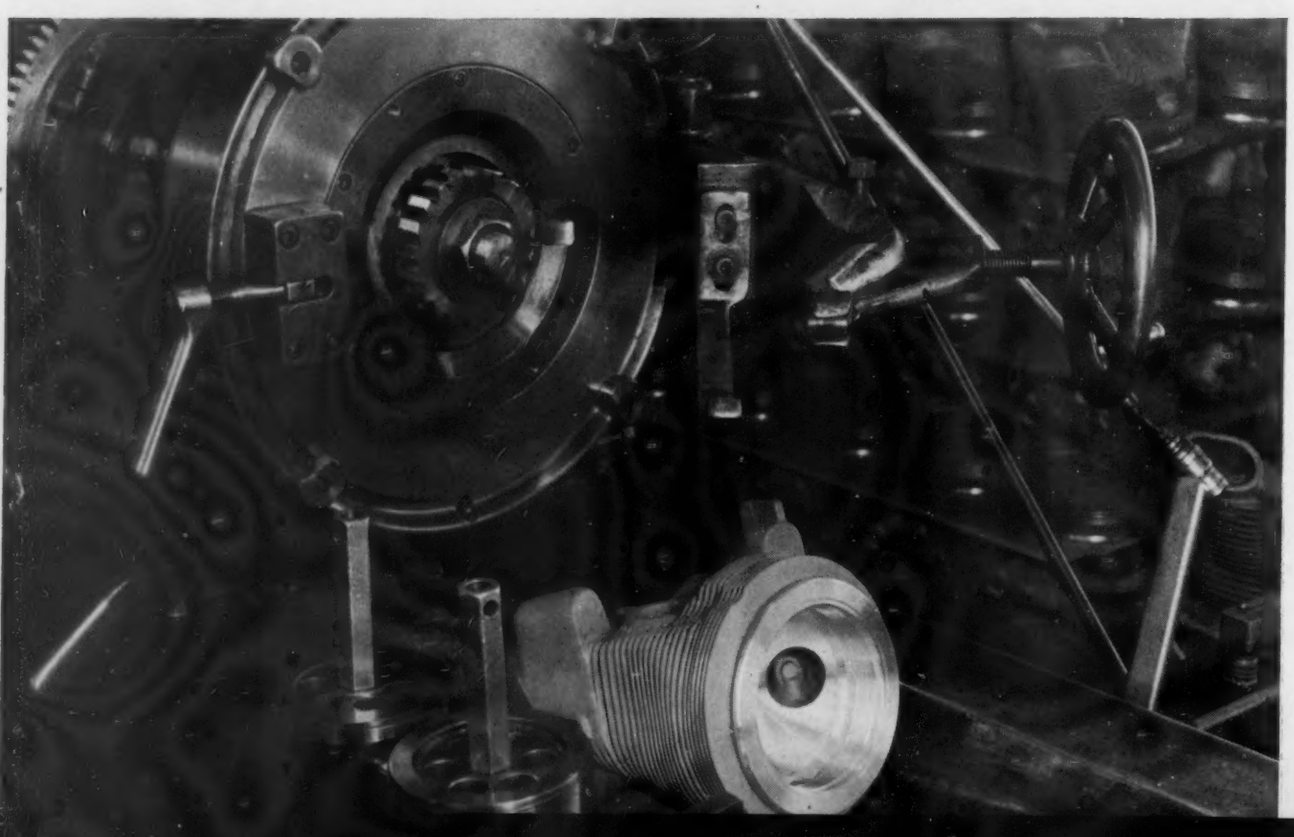
article that the machine tool industry in America was born of the art of war, don't lost sight of the fact that it was fathered in this country by national defense and not by aggression. Bear in mind also that subsequent remarkable growth and development of the machine tool industry in America very definitely has been under the influence of the arts of peace—aside from brief interludes 1812-15; 1846-48; 1861-65; 1898; and 1917-18.

Powerful interests in the Old World have persisted in considering machine tools primarily as instruments for providing more and better arms for bigger armies. In America, however—except during brief periods of national emergency just mentioned—the influential industrial, engineering and production brains have remained concentrated on the design, tooling, manufacture and use of machine tools as instruments for making available "more and better goods for more people." In doing this there have automatically been created more and better jobs for more people, thereby building up the markets for the more and better goods.

Here for instance are just a few of the interchangeably manufactured products which American machine tools have made available to the average American since Whitney's time: Cheap, dependable clocks; sewing machines; farm machinery; bicycles; low priced watches; fountain pens; typewriters and business machines; automobiles; washing machines; vacuum cleaners; mechanical refrigeration; automatic heating apparatus; radios; and even aircraft.

Carrying on subsequent to Whitney's time without governmental subsidies and under conditions of free competition, American machine tool builders have had to solve a constant procession of new and ever more difficult problems put up to them by the almost endless variety of metalworking industries. This continuous challenge to the native ingenuity of American machine tool builders has been "tough schooling"—but tremendously effective. This last is amply borne out by numerous examples of modern American machine tools and tooling methods featured in this insert—STEEL'S Machine Tool Show on Paper.

Hall planetary machine, shown below, mills threads and shrink bands in Pratt & Whitney cylinder heads—both at one setting, to very close limits, and in exact alignment with cylinder bore



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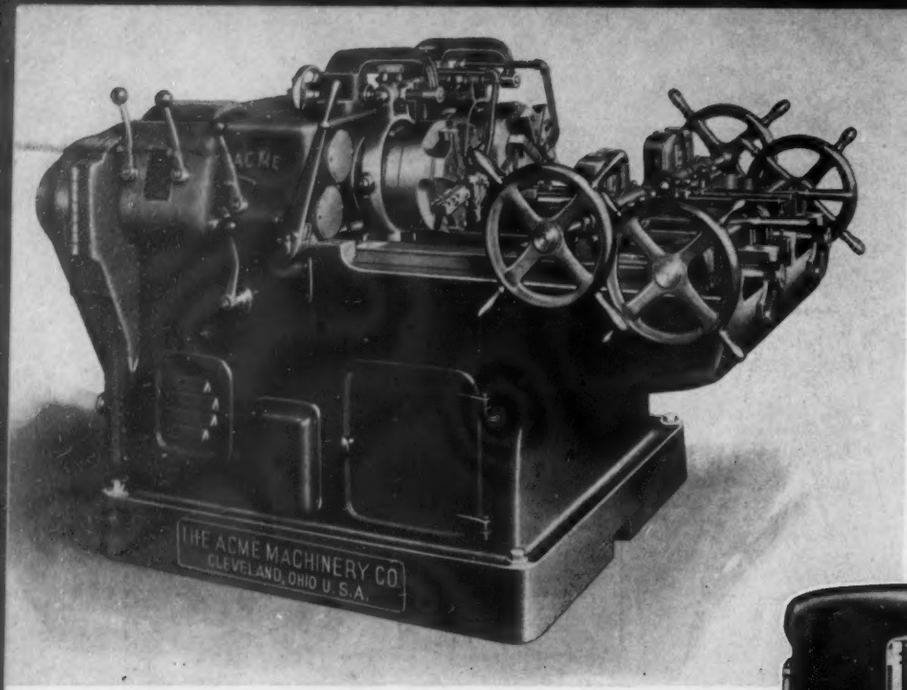
One of these many machines will exactly meet your requirements.

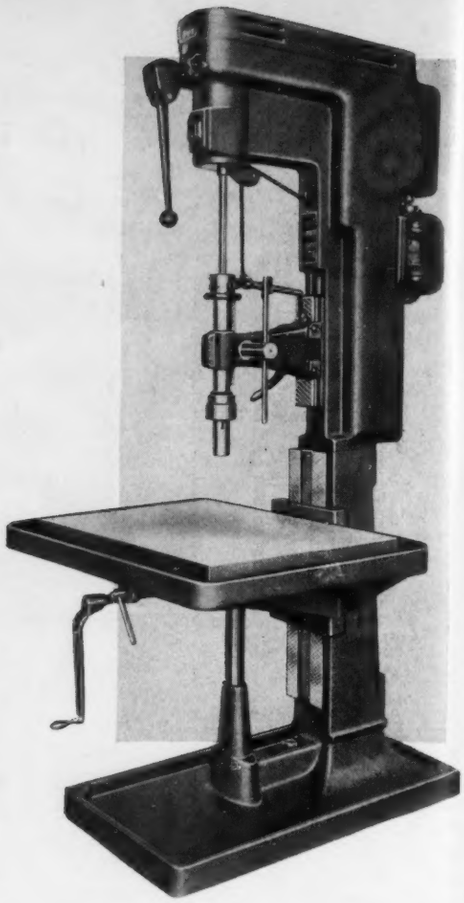
- **INTERNAL GRINDING MACHINES...** Plain and Semi-Automatic—Full Automatic Chuckers or Centerless—For very small or extra large work.
- **BORE-MATICS...** for precision boring, facing, turning—Single and Double End.
- **ROTARY SURFACE GRINDING MACHINES**

THE HEALD MACHINE COMPANY

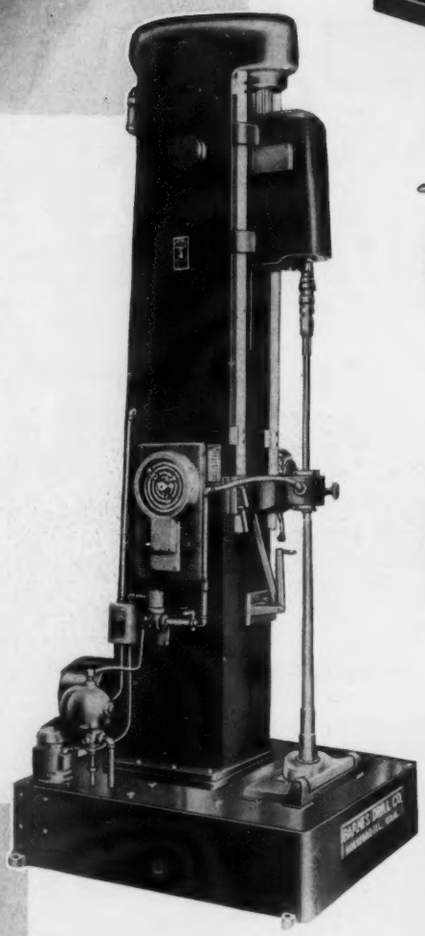
WORCESTER, MASS.



Acme 1½-inch model XL threading machine, above, with double spindle and arranged for motor drive to thread ½ to 1½-inch diameter bar stock. Acme Machinery Co., 4533 St. Clair avenue, Cleveland



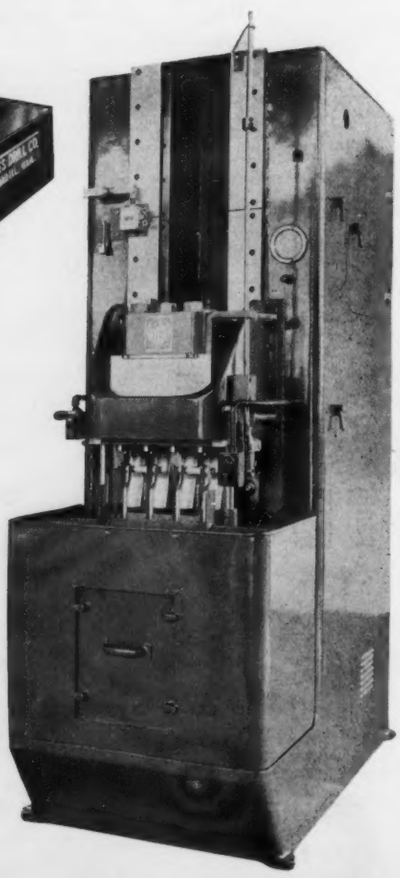
American VP-15-36 standard vertical hydraulic pull-up internal broaching machine, lower right corner. Arranged with four broaching stations, the machine has a semi-automatic cycle with a stop at the end of each cycle. American Broach & Machine Co. division of Sunstrand Machine Tool Co., Ann Arbor, Mich.

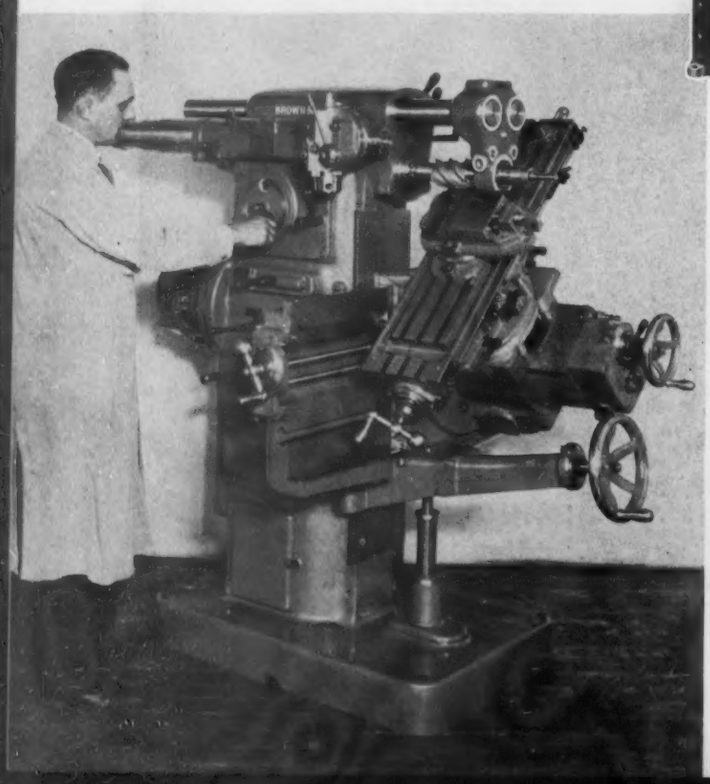


Avery drilling machine, upper right corner, with wide range of spindle speeds and belt connection between spindle and motor. Extra-large table furnished for tool and die shop use. Avery Drilling Machine Co., Cincinnati

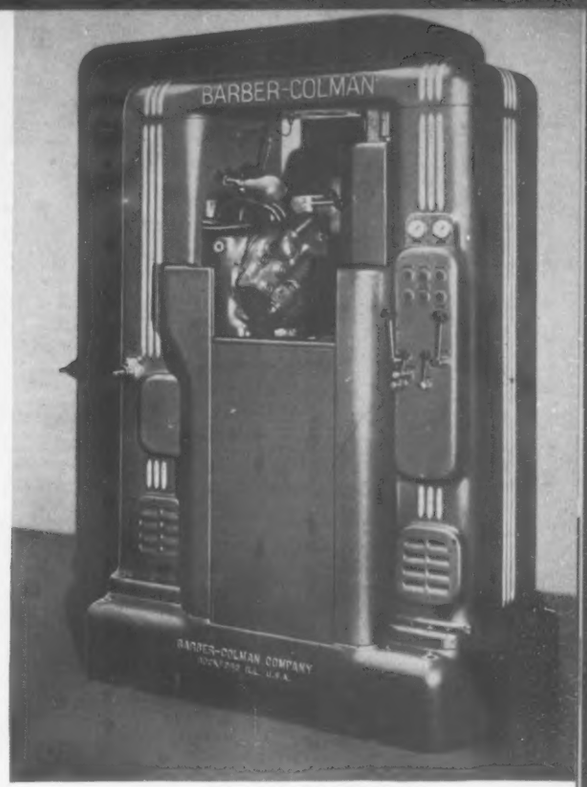
Barnes No. 224 vertical honing machine, immediate right, with hydraulic reciprocations provided on 22 inches of spindle travel. Transmission provides speeds of 150-250-400-600 revolutions per minute. Barnes Drill Co., Rockford, Ill.

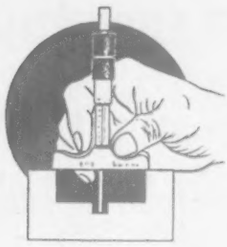
Brown & Sharpe Omniversal milling machine, below, has a universal work table permitting machining of difficult pieces without special fixtures. Power feeds in all directions. Brown & Sharpe Mfg. Co., Providence, R. I.





VERSATILE *New Machines*

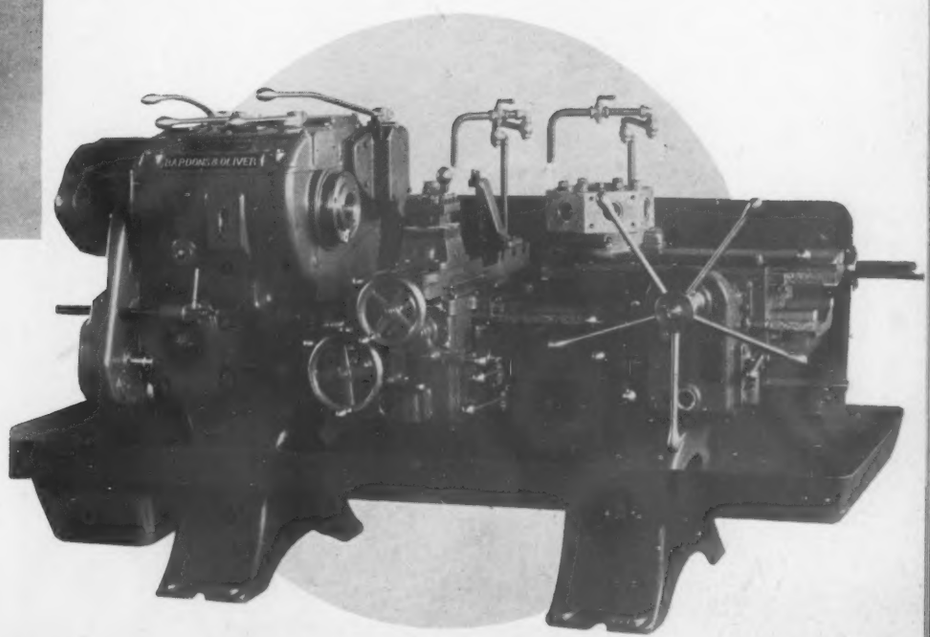


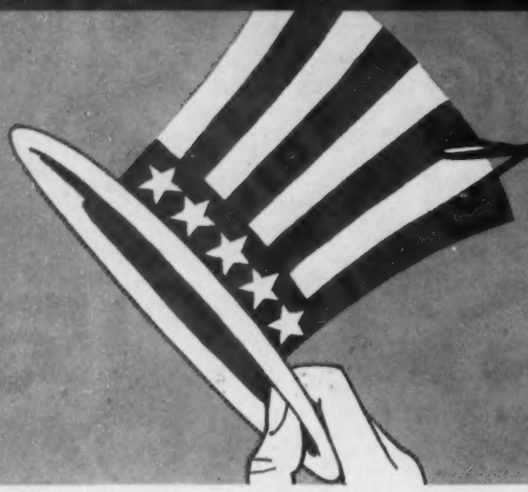


Barber-Colman type V automatic hobbing machine, above, has an automatic cycle which includes rapid traverse with conventional or climb cutting. Gravity intensifies stabilizing effect as the work-slide feeds upwards and aids rapid traverse downwards. Barber-Colman Co., Rockford, Ill.

Bardons & Oliver No. 7 universal turret lathe, below, with single lever hydraulic speed selector, direct reading feed charts on feed levers and third way on front of bed. Bardons & Oliver Inc., 1133 West Ninth street, Cleveland

Bausch & Lomb contour measuring projector, left, has a translucent screen on which appears an image erect, unreversed and undistorted in any magnification. Motorized focusing horizontal work table and rapid lens change are features. Screen is 18 inches in diameter. Bausch & Lomb Optical Co., Rochester, N. Y.





America takes its hat OF THE MACHINE

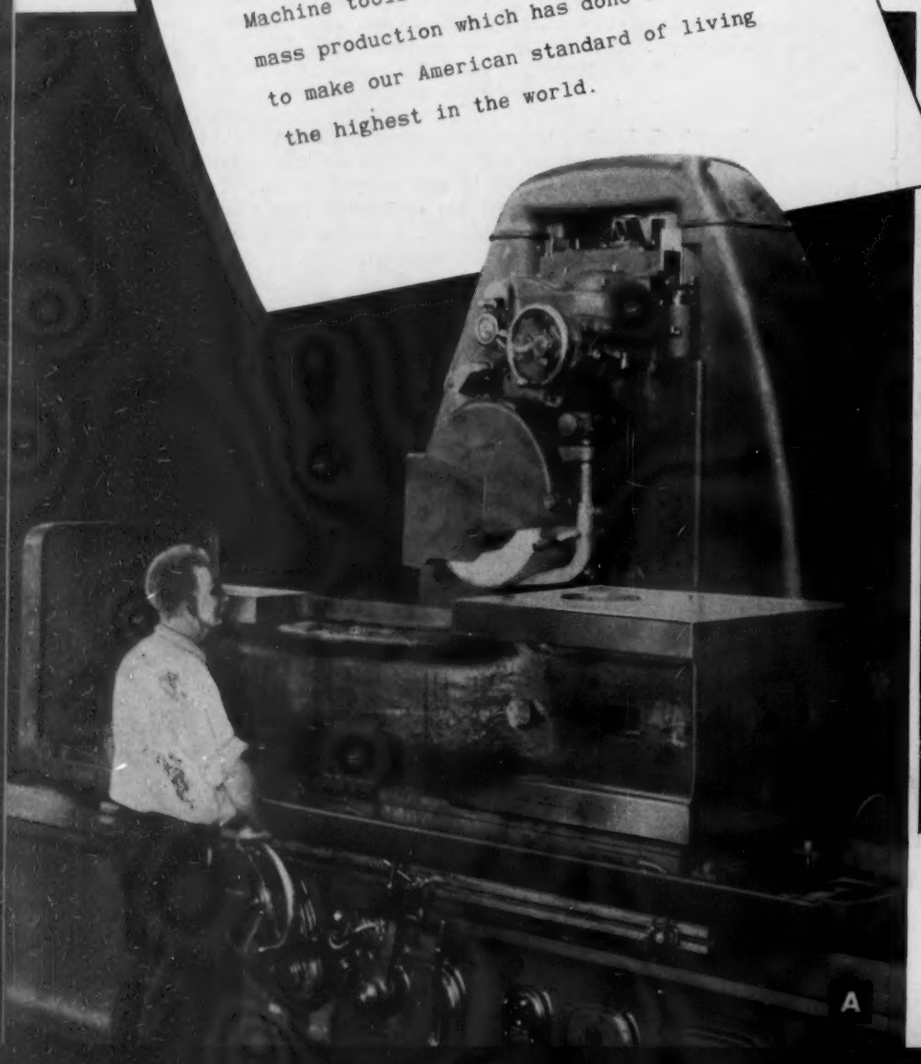
S. C. HOLLISTER,
DEAN OF THE ENGINEERING COLLEGE
CORNELL UNIVERSITY, *says:*

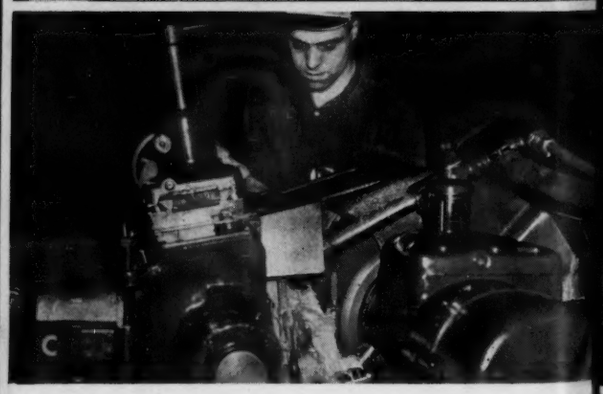
COLLEGE OF ENGINEERING
CORNELL UNIVERSITY
ITHACA, NEW YORK

S. C. HOLLISTER, Dean of the College

The master craftsmen who design and make the marvelous machine tools of today are largely responsible for the tremendous advance of our modern civilization. Machine tools make possible the precision mass production which has done so much to make our American standard of living the highest in the world.

CARBORUNDUM IS PROUD TO CONTRIBUTE TO THEIR SUCCESS IN THESE 2 IMPORTANT WAYS





A·B·C... In the building of the thousands o machine tools, from the grinding of massive ba castings to the highly accurate operating part grinding wheels by Carborundum render a grea important service to the Machine Tool Industry

off to the MASTER CRAFTSMEN TOOL INDUSTRY

PRECISION MASS PRODUCTION CREATES HIGHER STANDARDS

1. Carborundum Brand Abrasive Products are among the most indispensable tools used by the Machine Tool Industry. They play an important part in the actual building of the machines themselves . . . in bringing about their mechanical perfection . . . from the grinding of the base castings to the highly accurate grinding and finishing of such precision parts as bearings, spindles, feed mechanisms, lead screws, gears, ways and face plates.

2. Carborundum works hand in hand with the Machine Tool Industry in the development of grinding methods and the application of grinding machines . . . not only keeps abreast of each new advance, but is often ahead of it. A new grinding method, a new grinding machine, a new material to be ground may come up overnight. If production is to start, Carborundum must be ready with the right wheels to meet the new condition. Carborundum research is constantly at work meeting the grinding problems of today . . . and tomorrow.

(Carborundum is a registered trade-mark of The Carborundum Company)

F

D

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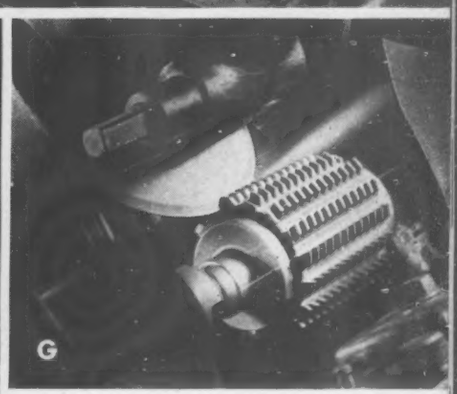


G

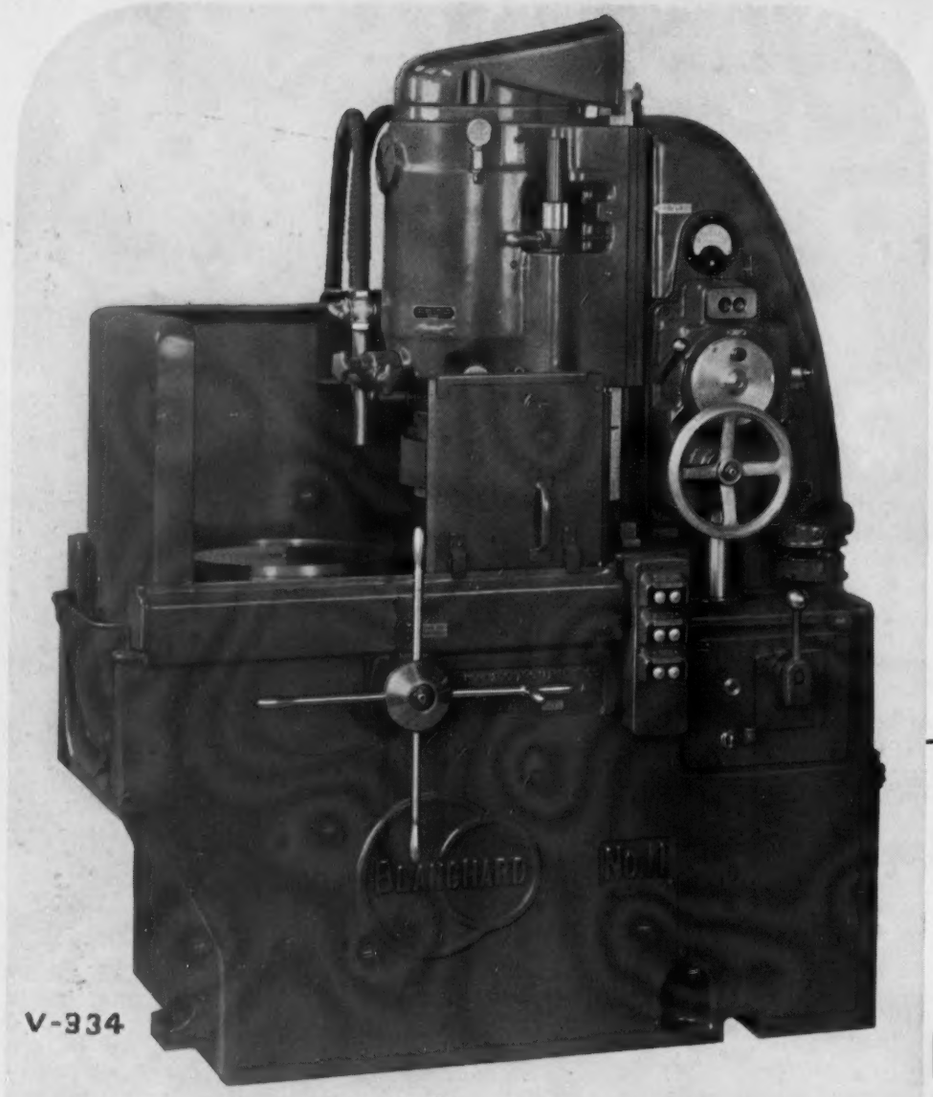
D *New high levels of precision, finish and production have resulted from the development of roll grinding wheels by Carborundum.*

E *Carborundum has made an outstanding contribution in the development of wheels for the modern centerless grinder.*

F *Carborundum research is responsible for much of the pioneering in thread grinding, and the development of suitable wheels for this operation.*

G *Another Carborundum achievement has been the development of tool room grinding wheels for the production of precision tools.*

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N.Y.



New #11 BLANCHARD GRINDER

FOR PROFITS MACHINE TOOL SHOW
CLEVELAND
OCT. 4 to 13, 1939

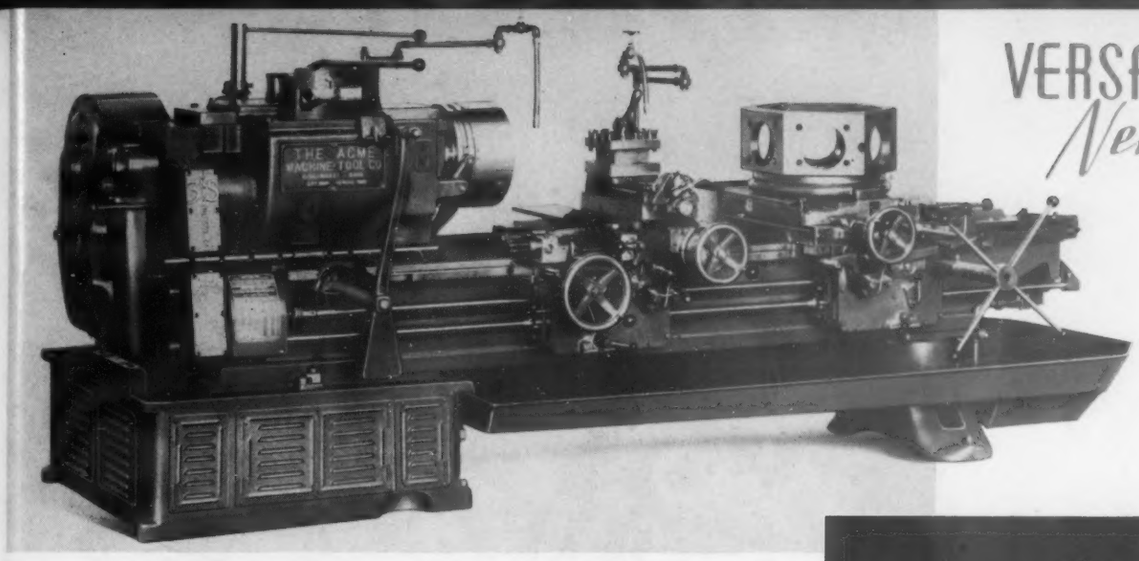
This new small Blanchard has the power, the rigidity, and the ease of control that have made the No. 18 Blanchard so successful. Smaller in overall size than the No. 10 Blanchard which it supersedes, it not only has 50% more power on its spindle but has larger work capacity, 20 inches diameter by 8 inches high under new wheel. Fast, accurate, easy to operate, it is bound to be popular for tool work or small lot production.

Before you see this machine at the Cleveland Show, study the details in the No. 11 Blanchard Catalog. Write for your copy today!

BLANCHARD

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE, MASS., U. S. A.

VERSATILE *New Machines*

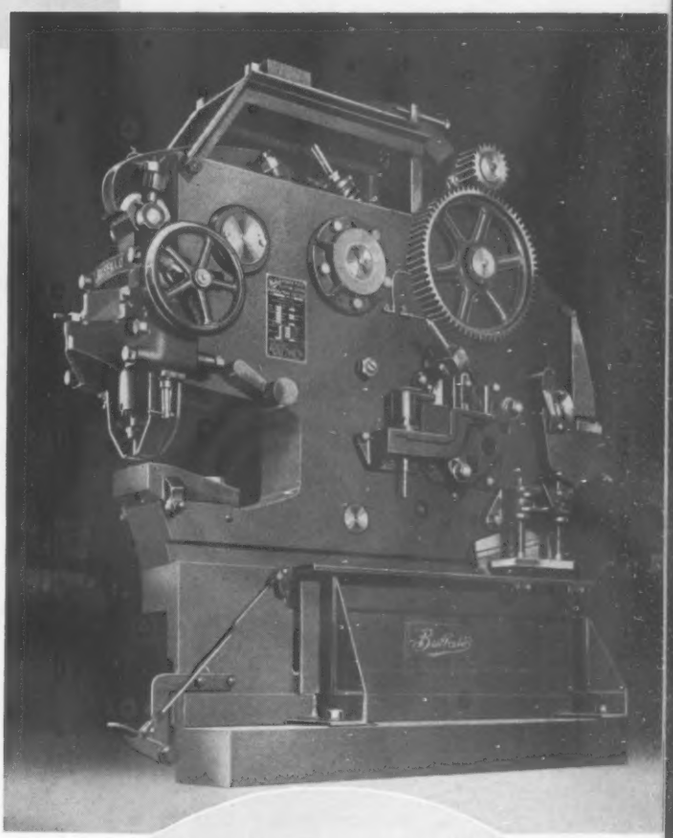


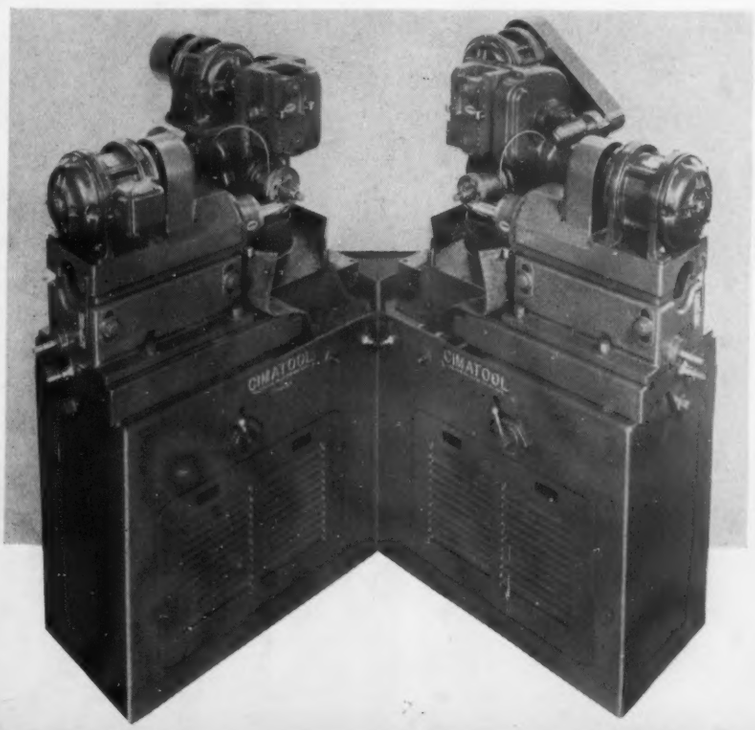
Acme 3-S heavy-duty universal turret lathe, above, has a pyramid type headstock and greater distance between vees. A Hydro Electric Duplicator attachment can be mounted on this lathe for contour boring and turning. Acme Machine Tool Co., 4955 Spring Grove avenue, Cincinnati

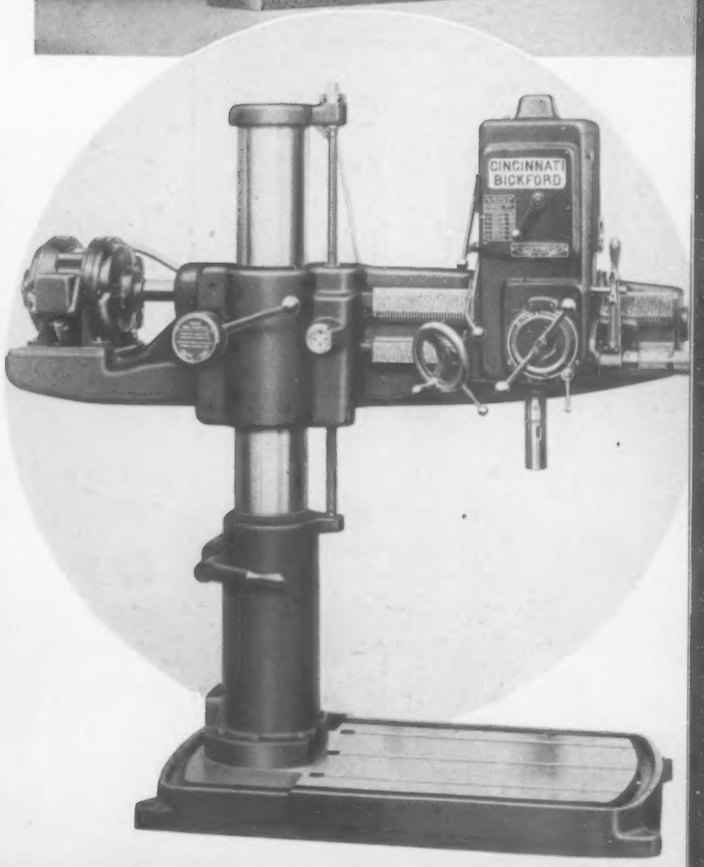
Buffalo Forge No. 2½ universal ironworker, right, combines the advantages of five separate tools in one unit. Frame is heavy armor plate electrically welded into a solid unit. Buffalo Forge Co., 465 Broadway, Buffalo

Cimatool No. 103½-C chamfering machine, left below, has two work heads and two cutter spindles which may be set to chamfer two gears simultaneously or indepen.dently. Cimatool Co., Dayton, O.

Cincinnati Bickford 2½-foot high-speed super service radial drill, lower right, is designed especially for small drilling and tapping in fairly large parts. Drill has six spindle speeds and three rates of power feed. Automatic tapping control is available. Cincinnati Bickford Tool Co., Oakley, Cincinnati







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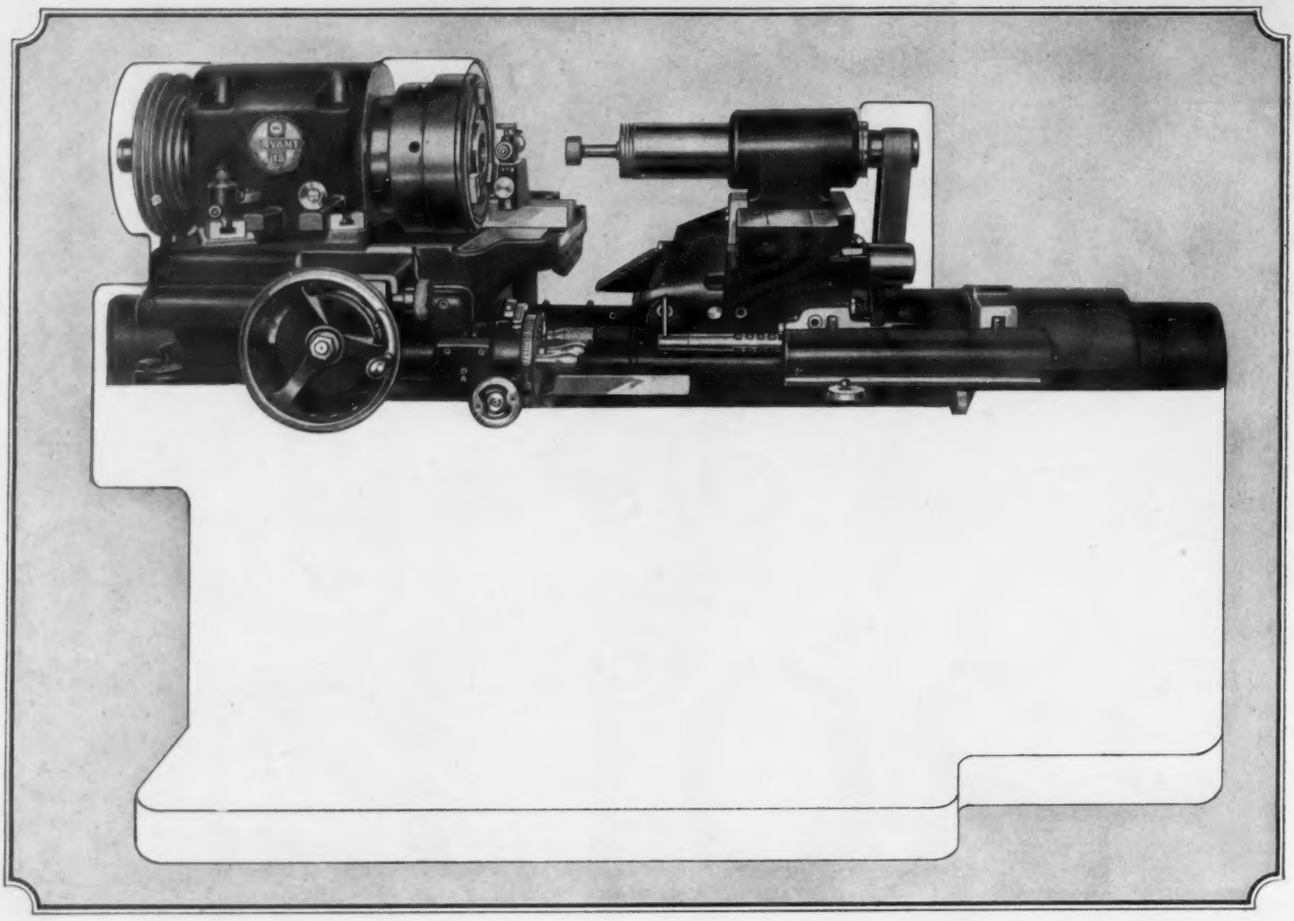

THE NEW BRYANT 112 INTERNAL GRINDER

12″ SWING AND 12″ STROKE

With Underhead Slide Bar

The new Bryant 112 retains every familiar fundamental advantage of Bryant construction.

By locating the slide bar underneath the head, this new Bryant 12″ Model is cleared overhead, a feature which is considered desirable on certain types of work.

As in other Bryant Grinders, the wheel slide is supported by large rigid bearings at each end of slide bar, and a third bearing, attached to the wheel slide gives three point support. These bearings are fully protected from grit and dirt in all positions of the wheel slide. The workhead is adjustable to 45° angle making it possible to grind up to 90° tapers inclusive.

It is also possible to grind curved surfaces conveniently on this grinder.

The Bryant 112 is another outstanding contribution by Bryant to accurate and low cost internal grinding. For descriptive literature, write:

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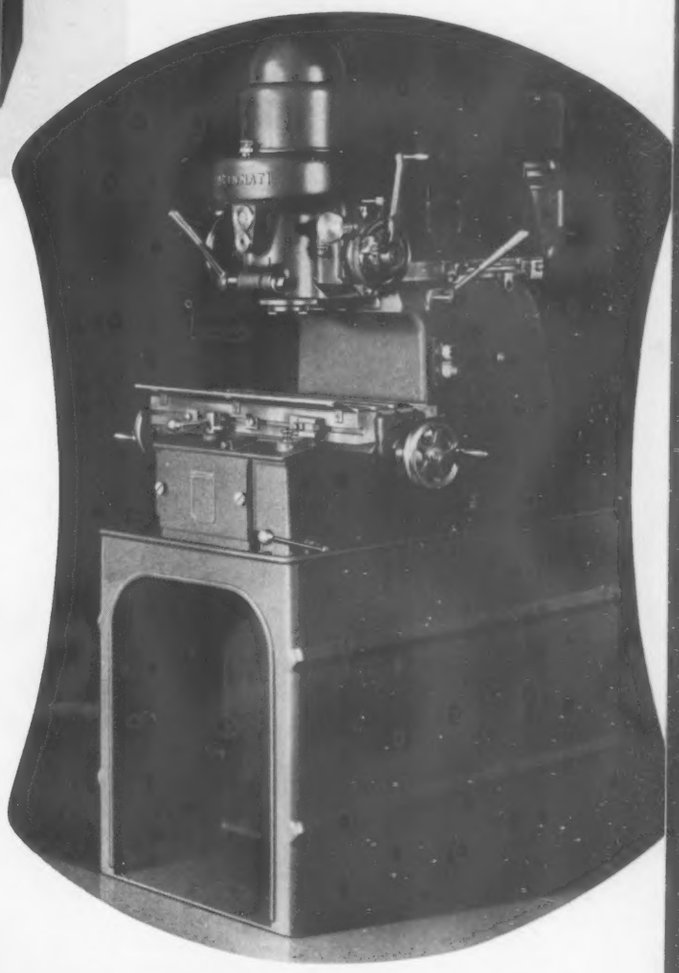
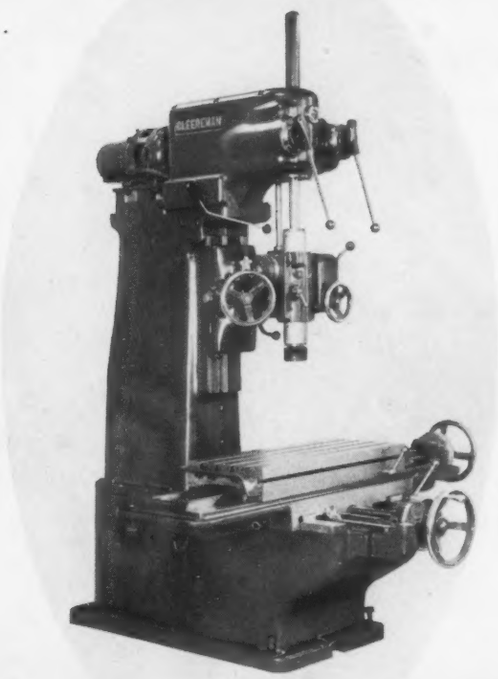
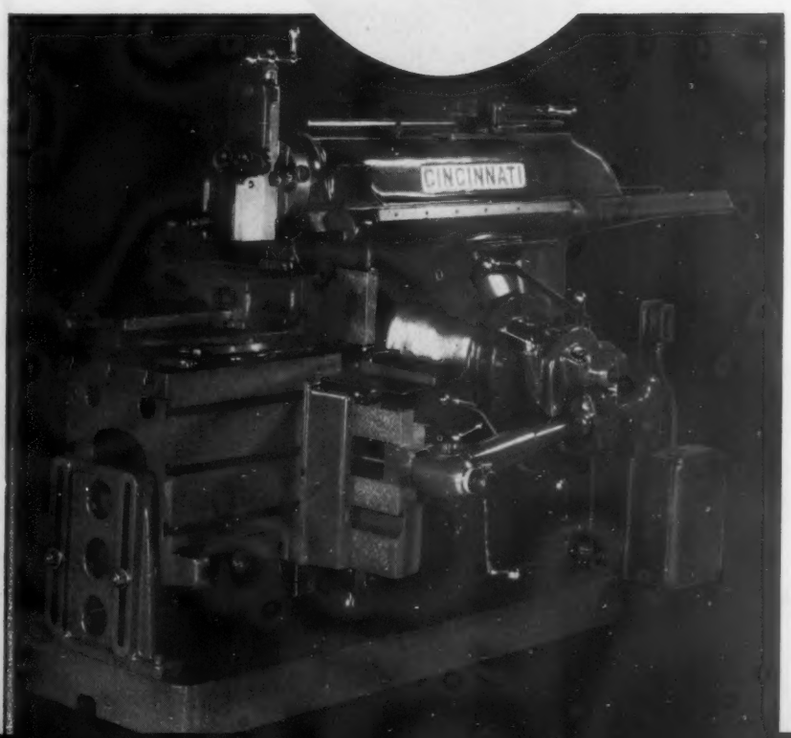
VERSATILE *New Machines*







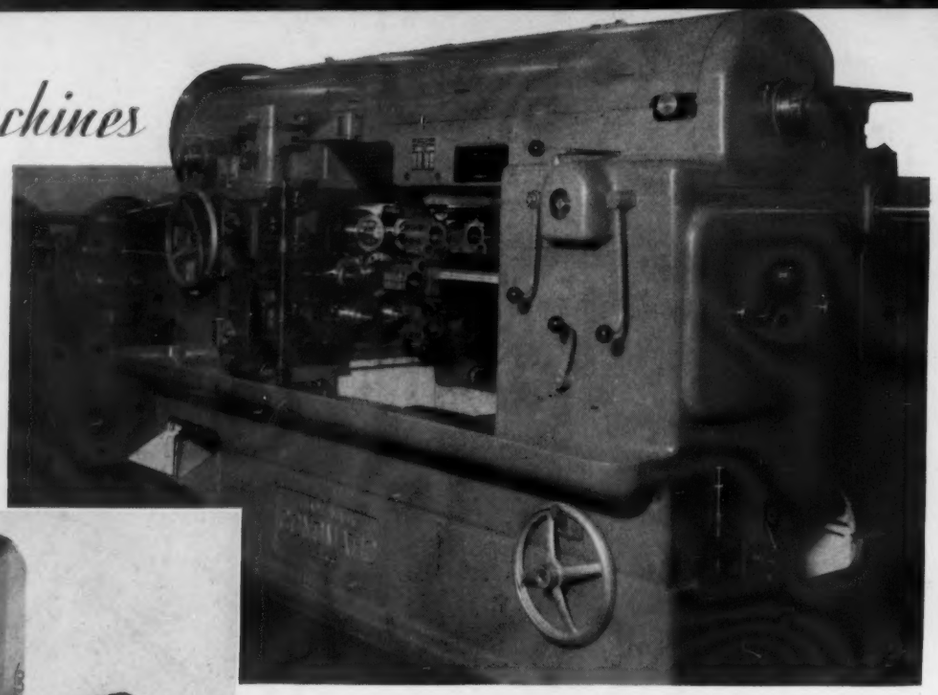
Cincinnati No. 0-8 vertical milling machine, center right, has eight spindle speeds ranging from 150 to 1300 revolutions per minute and two series of eight table feeds from ½ to 10¼ inches per minute. Power rapid traverse at 100 inches per minute. Cincinnati Milling Machine Co., Oakley, Cincinnati

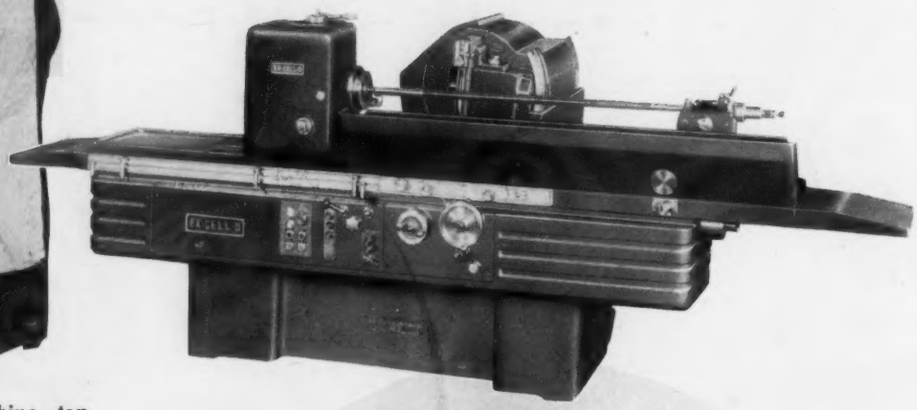
Cincinnati 24-inch heavy duty rapid traverse shaper, left, has multiple cam feeds, direct reading dials and automatic oiling. Cincinnati Shaper Co., Hopple, Garrard and Elam streets, Cincinnati

Cleereman jig borer, oval inset, is equipped with end measuring rods, precision lead screws, power rapid traverse in both directions, spindle depth gage and micromatic sliding head gage stop. Twelve spindle speeds in a 40 to 1 ratio are available. Cleereman Machine Tool Co., Green Bay, Wisc.

Cleveland single-spindle automatic, top left, of 1 1/16-inch bar capacity, with second operation unit in place and set up for slotting rear end of work after cutoff. Cleveland Automatic Machine Co., 2269 Ashland road, Cleveland

VERSATILE *New Machines*





Cone 6-spindle Conomatic automatic screw machine, top, has open end gearing, high and low speed cam action disconnectable by operator when checking gears and instantaneous power feed engagement. Cone Automatic Machine Co. Inc., Windsor, Vt.

Continental model V-26 Doall contour shaping machine, center left, can take precision band saws from 1 millimeter to 1 inch in width. It has a 26-inch throat depth and a 30 x 30-inch work table inclinable in any direction. Continental Machines Inc., 1301 Washington avenue south, Minneapolis

Elwell-Parker F-15 center drive fork truck, right, is rated at 4000 pounds and may be powered by a battery or a gas-electric unit. It is built either as a telescoping or nontelescoping truck for inside car work or high tiering of pallet loads. Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland

Ex-Cell-O No. 50 precision thread grinder, center right, will grind threads up to 12 inches in diameter and 50 inches long on work 115 inches between centers. Machine is hydraulically operated and controlled. Ex-Cell-O Corp., 1200 Oakman boulevard, Detroit

. . . "What's New With *Linde* Today?"

LINDE'S widespread reputation for progressiveness is one of the many reasons why Linde representatives find a "welcome mat" on the doorstep of every type of industry. Frequently, the greeting accorded the Linde man who walks in is, "What's new with Linde today?"

For metalworking men have learned that usually Linde *does* have something new — some new process, or new piece of equipment, or a new application to help do a job better or quicker, or at less cost.

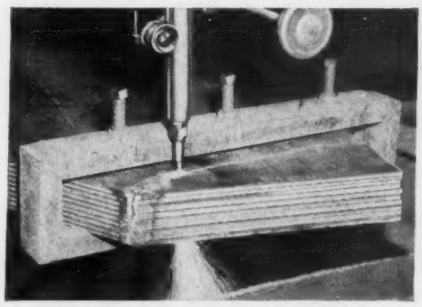
Yet the most vital factor in Linde's relations with industry is not new at all—and that is the established ability to help customers use Linde products effectively.

For many years, Linde Process Service has brought to Linde customers—large and small—the cumulative field experience and process data of a capable engineering staff which is integrated with a well-developed research organization.

The Linde man who calls on you will gladly point out why customers feel this service is as important to them as the high quality and fair price of all Linde products. The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation. Offices in principal cities.

WRINKLE-BENDING—an oxy-acetylene process for bending pipe. This process makes smooth, easy bends without stressing the pipe, thinning the wall, or offering any internal obstruction to flow. It can be used on any size pipe—light or heavy wall—requires no heavy equipment, and can be performed quickly and economically. Linde men can show you how to do it.

THERE IS MORE TO Linde THAN "EVERYTHING FOR WELDING AND CUTTING"



STACK-CUTTING — an oxy-acetylene process used more and more for quantity production of shaped parts. It is fast, easy, and economical when you know how and have good equipment. Linde can supply both.

GOUGING—a fast means of removing surface metal without harm to adjacent areas. Used in removal of defective or temporary welds and for correction of design on castings or heavy structural members.

HEAVY HEATING—The Oxweld W-26 Blowpipe was developed to throw a terrific amount of heat. It can be used effectively for hundreds of forging, forming, straightening, bending or pressing operations.

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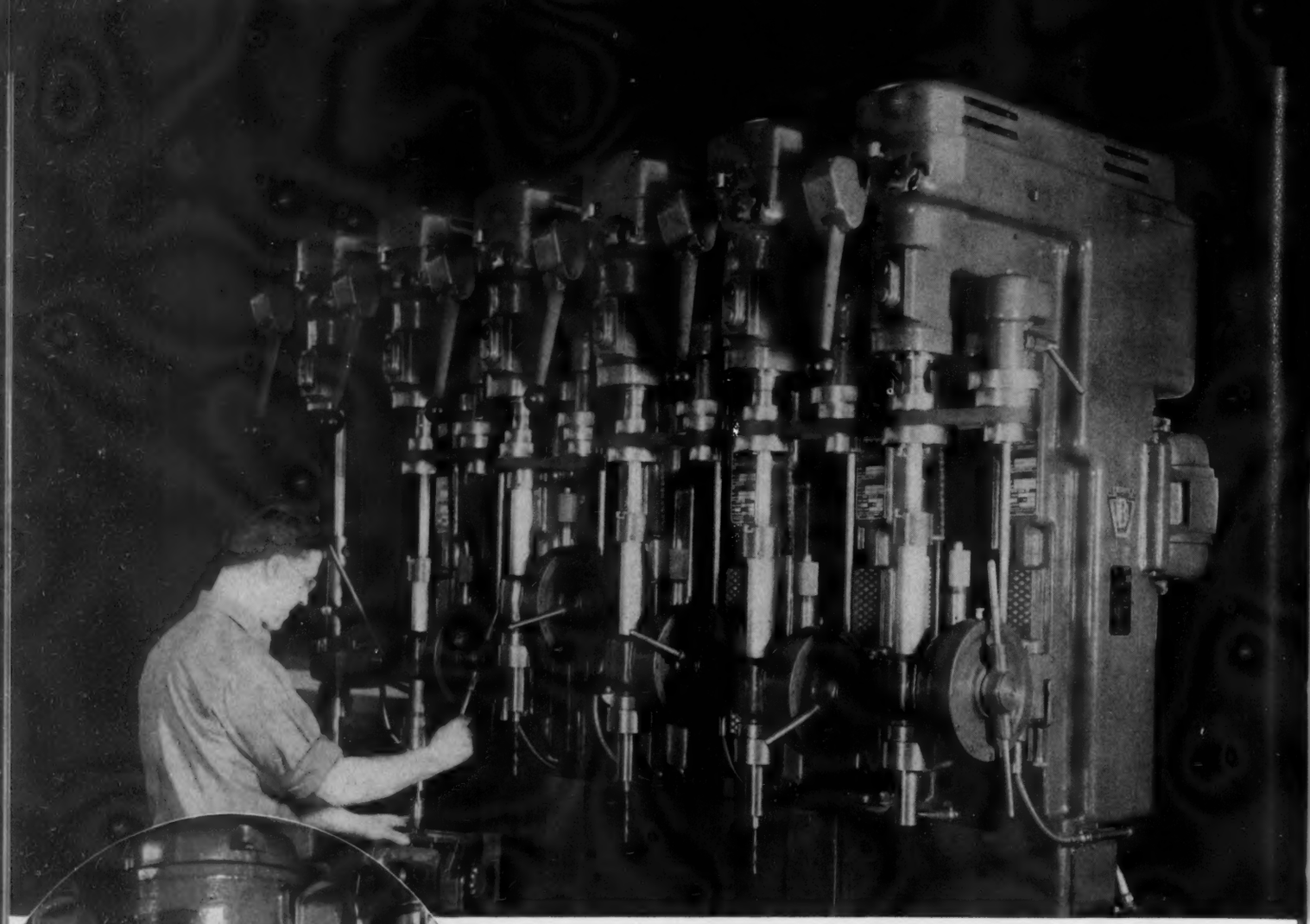
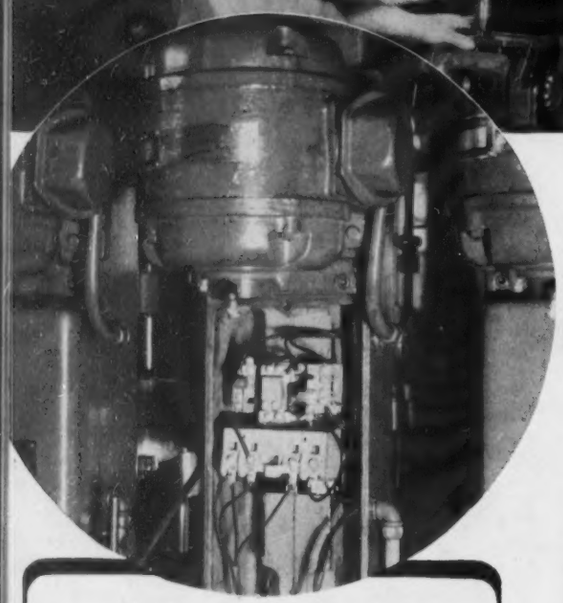
The words "Linde," "Union," "Prest-O-Lite," "Oxweld" and "Unionmelt" are trade-marks of Units of Union Carbide and Carbon Corporation.

Learn all about the revolutionary Unionmelt welding process and other new processes and products developed by Linde, at Exhibit Areas L302 and M301, National Metal Exposition, International Amphitheatre, Chicago, October 23-27, 1939.





Standardized Westinghouse Drive on this machine consists of:

6 — Spindle drive motors

6 — Linestarter units

1 — Coolant pump motor

1 — Manual Starter for coolant pump motor . . .

BETTER MACHINES FOR LESS MONEY..

VERSATILITY OF WESTINGHOUSE EQUIPMENT HELPS KEEP COSTS DOWN ON NEW AVEY DRILLING MACHINE

By combining drilling and tapping operations, modern drilling machines provide unusual savings in comparison with old design machines. For example, this multi-spindle No. 2 Avey Drilling Machine, drilling and tapping semi-steel castings for small compressors, has effected savings as high as 30%.

Five drilling spindles with automatic feed and one hand fed tapping spindle are driven by standard Westinghouse motors, vertically mounted on rear of the spindle column.

Motor control is accomplished by mounting standard Westinghouse Linestarter units inside the column and immediately below the motor, minimizing wiring connections as shown in the inset.

This typical example shows how standard Westinghouse motors and control can be used to improve machine tools, yet save both first and operating costs. For help in solving your drive problems, call our local office, or address Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

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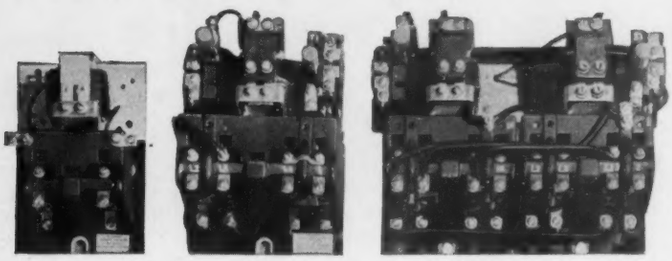
Westinghouse

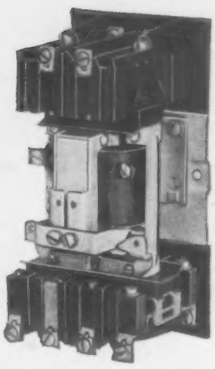
WESTINGHOUSE ELECTRIC

SAVE COST OF SPECIALS

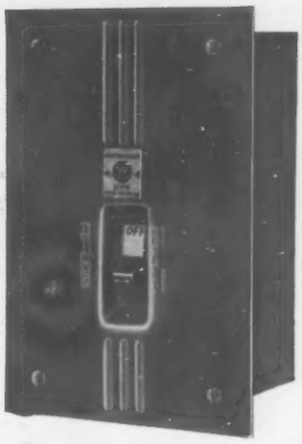
with Standardized Drives

BUILT-IN MOTOR CONTROL FROM STANDARD UNITS





Across-the-line motor starters and contactor units, suitable for practically all built-in applications. Provide motor overload and undervoltage protection and all circuit interlocking functions.



FLUSH TYPE MANUAL STARTER

Manual starter for drives up to 7½ hp. Handle indicates at a glance whether starter is on, off, or tripped.

STANDARD MOTOR AND CONTROL EQUIPMENT IN MANY VARIATIONS SIMPLIFIES MACHINE DESIGN PROBLEMS

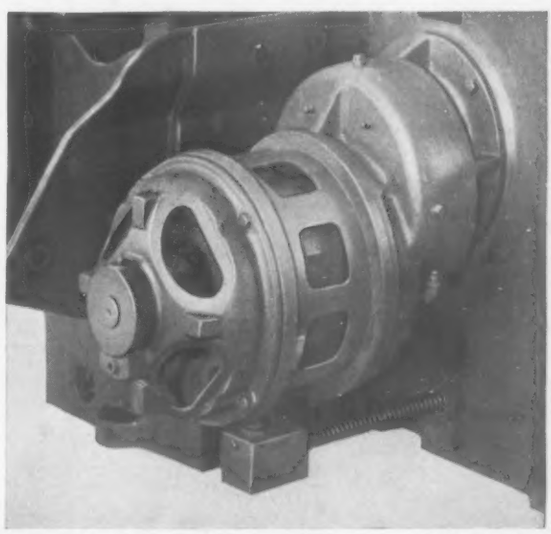
VERTICAL MOUNTING TYPE

STANDARD HORIZONTAL BALL BEARING MOTOR GOOD FOR VERTICAL OPERATION AND FREQUENT REVERSALS

Provides the necessary torque for drilling applications and handles frequent reversals on tapping.

GEARMOTOR TRANSLATES THE POWER DIRECT TO THE REQUIRED RPM

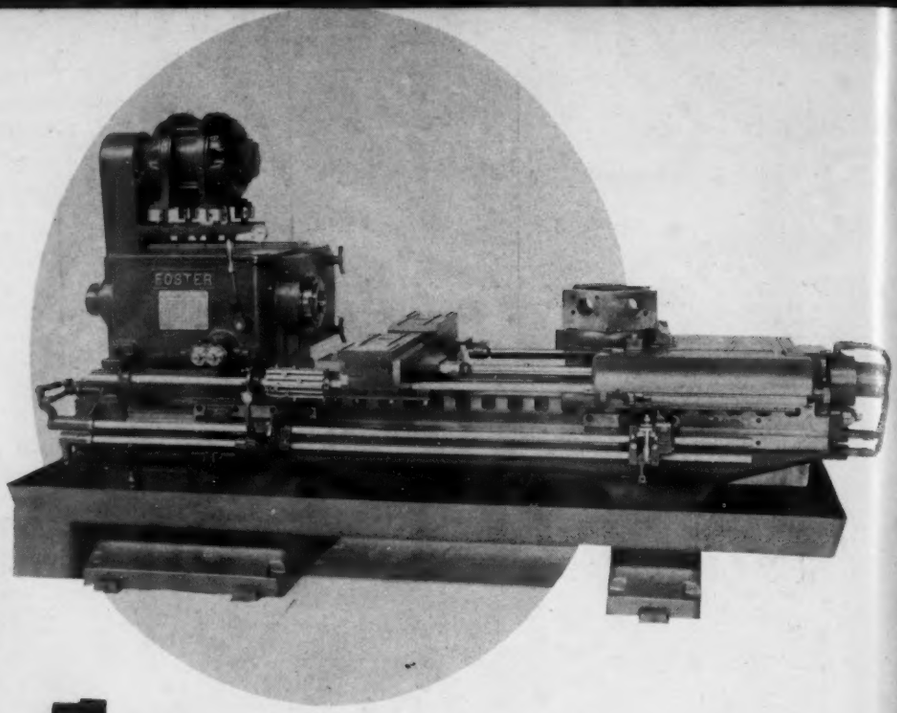
Let gearmotors solve the problem of motor output speed. Simply specify the horsepower and rpm of the driven machine and get the answer in one space-saving unit.

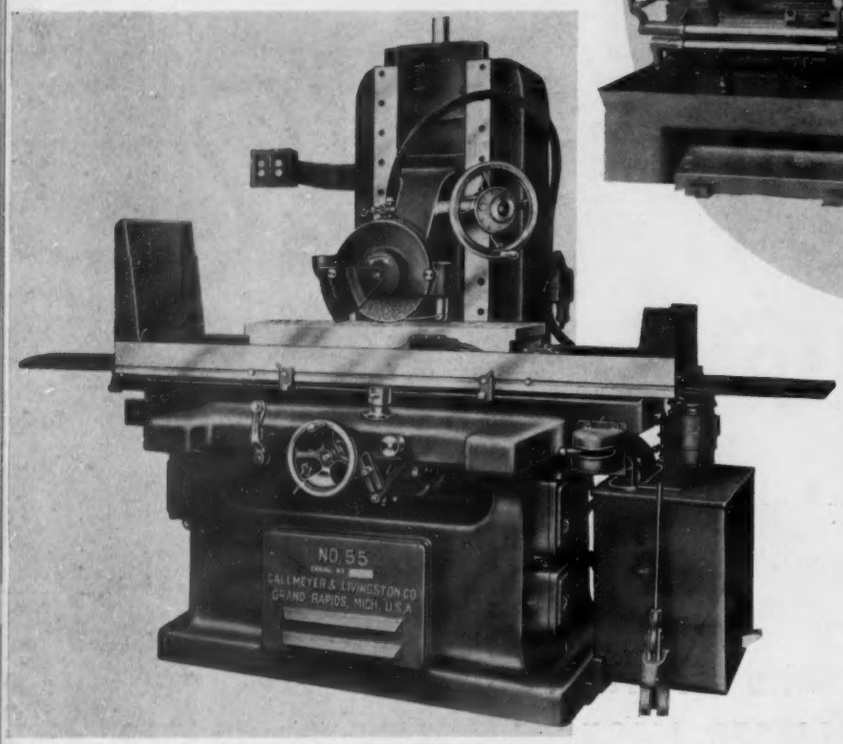


GEARMOTOR FOR FLANGE MOUNTING

Motors and Control

VERSATILE
New Machines



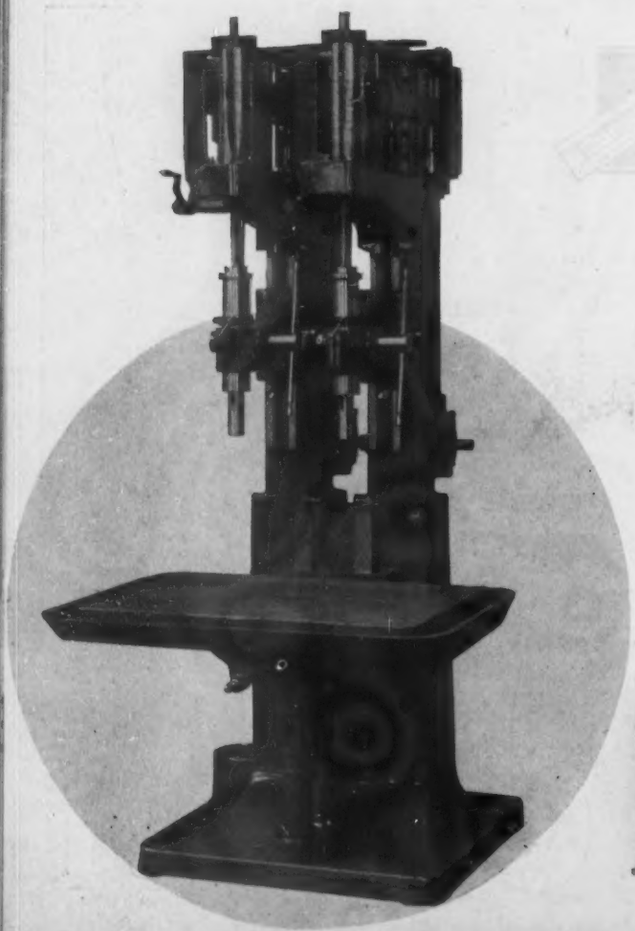


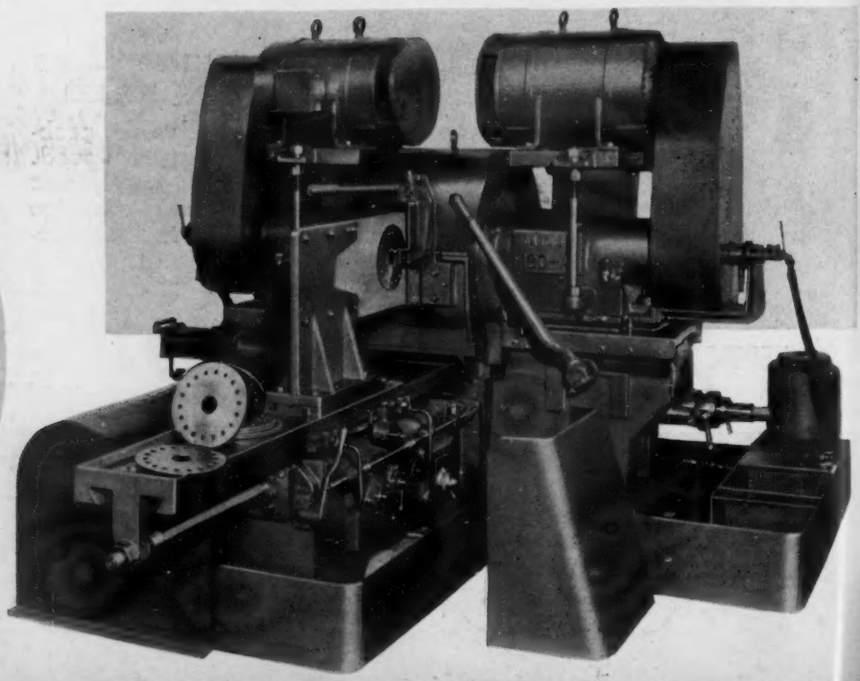
Foster 2-F Fastermatic automatic turret lathe, above, comes regularly with 28 changes of speed although from 17 to 263 or more may be had if desired. It is possible to have 4 spindle speed changes with every forward movement of the turret. Foster Machine Co., Elkhart, Ind.

Fosdick high-speed ball-bearing sensitive drill, left below, has lubrication of the spiral gears and a wider belt. Belt shifter automatically releases tension on belt and shifts belt from larger to smaller step of cone pulley before shifting to the larger step. Fosdick Machine Tool Co., Blue Rock and Apple streets, Cincinnati

Gallmeyer & Livingston No. 55 precision tool room type hydraulic feed surface grinder, left, has a maximum longitudinal table speed of 150 feet per minute. Hydraulically-actuated cross feed may be set to operate at each reversal of reciprocating table or at the end of each stroke only. Micrometer adjustment of wheel head. Gallmeyer & Livingston Co., Grand Rapids, Mich.

Gardner No. 120-A, 26-inch double spindle grinder, below, for grinding thin pieces with large areas. Will grind automobile clutch spring disks at the rate of 70 to 80 per hour on two parallel faces held within 0.001-inch for parallelism and within 0.003-inch for uniformity. Gardner Machine Co., Beloit, Wisc.





CONTROLLED PRECISION from FORGED rings to finished bearing

Forged for exact *control* of shape and grain flow; for maximum strength and resistance to wear — manufactured with completely *controlled* precision at every step, New Departure Ball Bearings are used by builders everywhere, to make fine machine accuracy permanent. . . . . New Departure, Division of General Motors, Bristol, Connecticut.

NEW DEPARTURE

THE FORGED PRECISION BEARING

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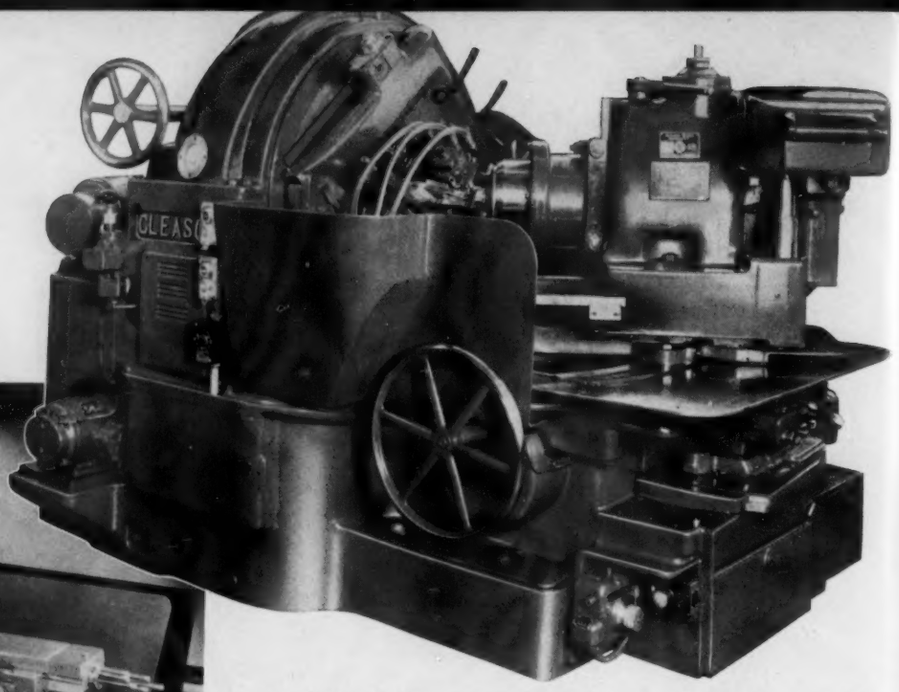
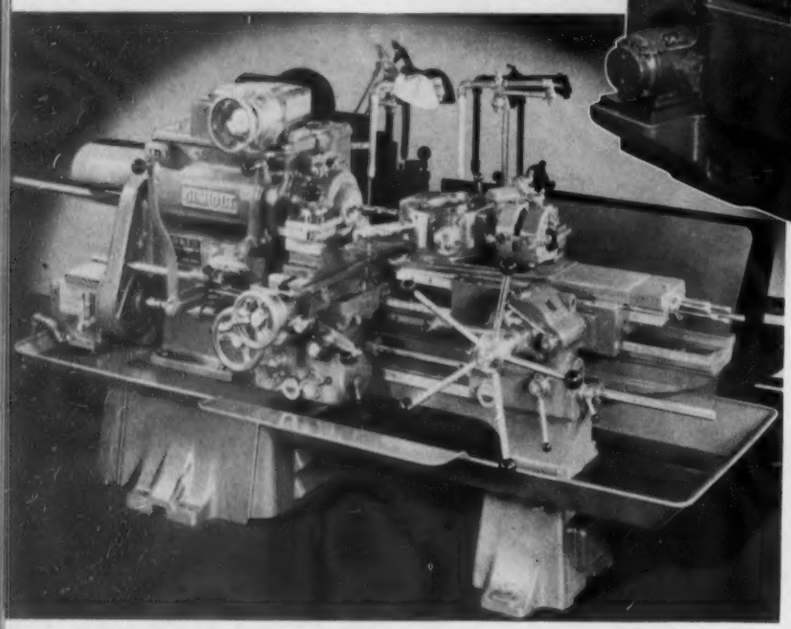




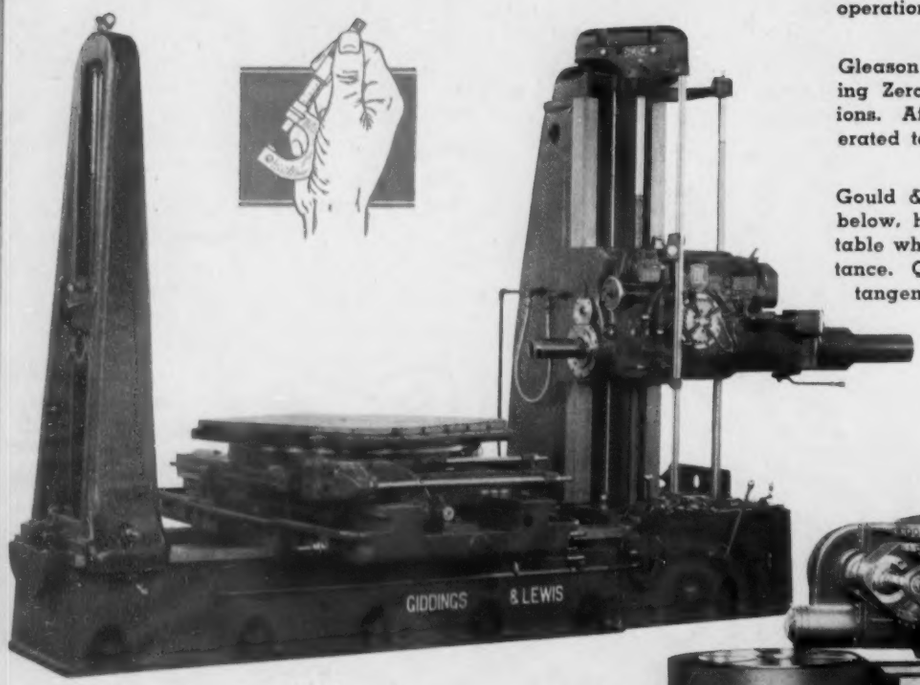
Niles 30-inch Time Saver lathe, lower left corner, has 48 feeds available ranging from 1/64 to 1 inch and speeds from 3.94 to 232 revolutions per minute. Positive fine-tooth clutch allows instantaneous disengagement of feed. General Machinery Corp. Niles Tool Works division, Hamilton, O.

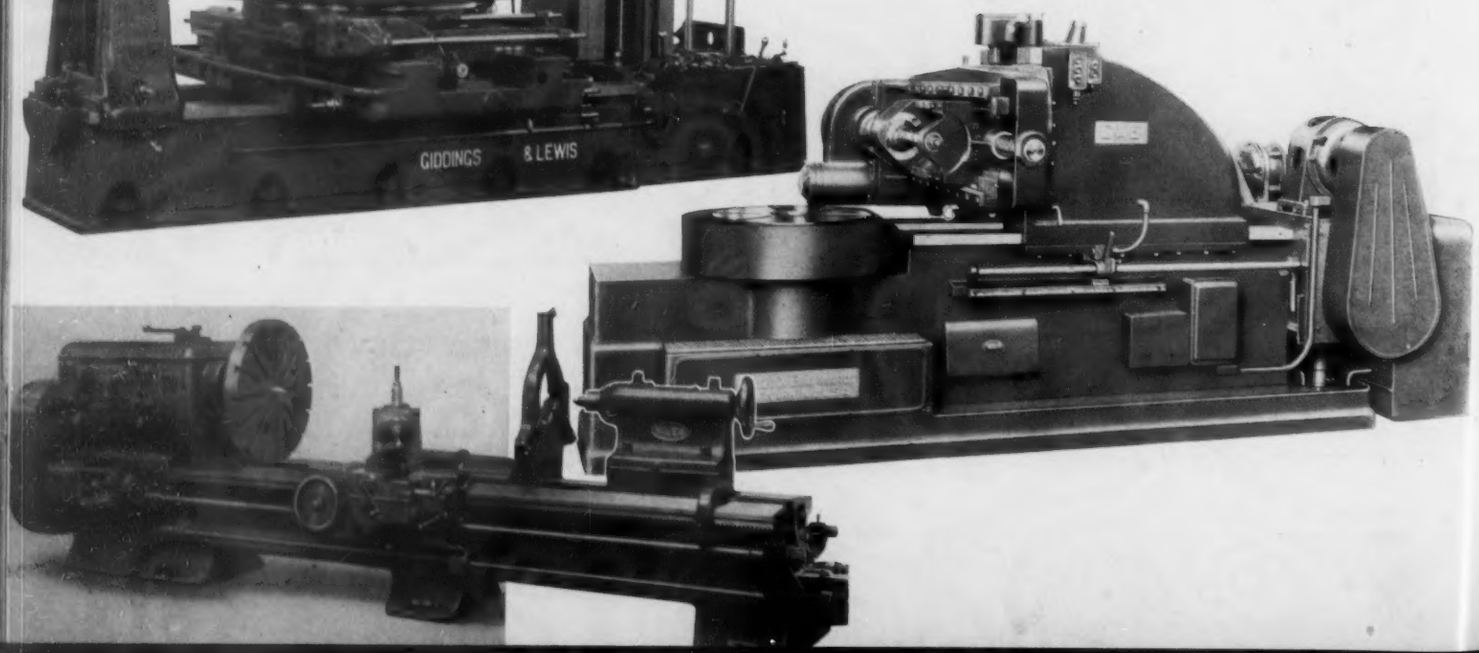
Giddings & Lewis heavy-duty 50 Series horizontal boring, drilling and milling machine, to the left just below, features independent operation of units, rotary feed selector, wide range of boring and milling feeds, direct-reading dials, automatic depth gage, safety limit switches. Giddings & Lewis Machine Tool Co., Fond du Lac., Wisc.

Gisholt No. 5 ram type universal turret lathe, above left, has a hydraulic speed selector, bar feed and 10-inch three jaw air chuck. Speed selector provides three methods of operations: Direct, pre-set, high-low. Gisholt Machine Co., Madison, Wisc.

Gleason No. 15 gear and pinion grinder, above, for grinding Zerol bevel, spiral bevel and hypoid gears and pinions. After chucking, operation is entirely automatic. Generated tooth profiles are ground with a relative rolling motion. Gleason Works, Rochester, N. Y.

Gould & Eberhardt 40-TWG worm gear hobbing machine, below, has a dual-lead worm-gear final drive to the work table which prevents backlash without disturbing center distance. Quick-change feed case provides 32 changes for both tangential and infeed. Gould & Eberhardt, Newark, N. J.

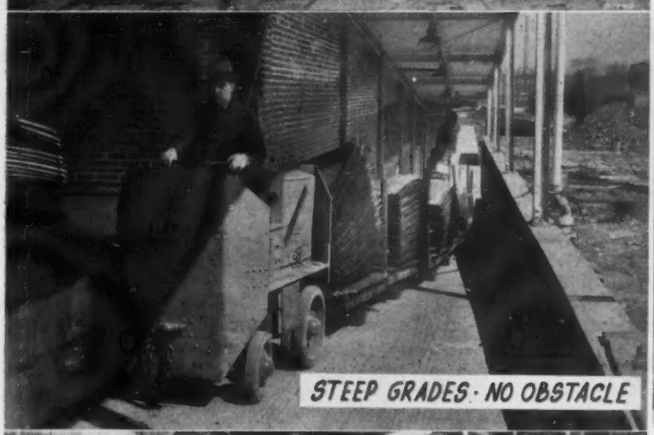




56% OF PRODUCT COSTS GOES INTO HANDLING

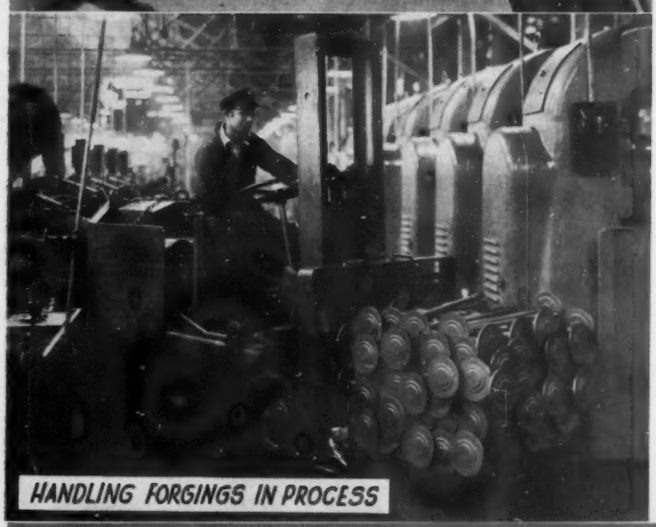
TOWMOTORS CLEVELAND CUT HANDLING COSTS AS MUCH AS 50%

LOADING HIGHWAY TRUCKS



STEEP GRADES · NO OBSTACLE

LOADING AND UNLOADING BOX CARS



HANDLING FORGINGS IN PROCESS

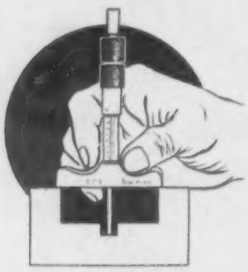
Most reliable estimates place total material handling costs at 56% of average prices we pay for finished products. This includes ALL FORMS OF HANDLING from raw materials at mine and mill to fabricating, processing, assembling, factory conveying, warehousing, reshipping and delivery.

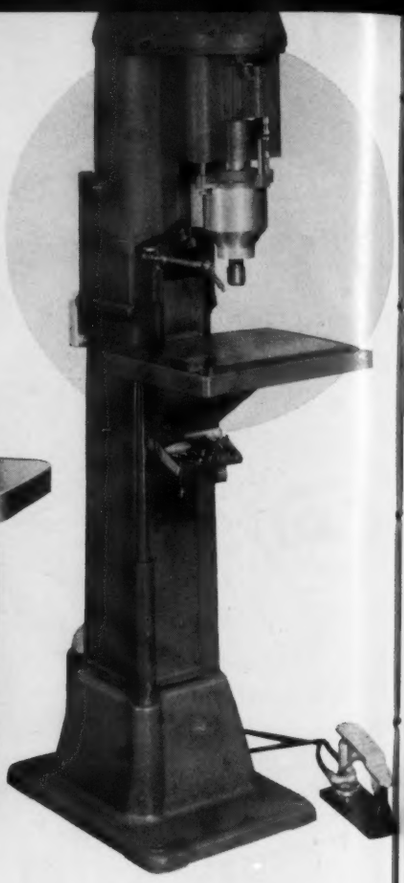
TOWMOTORS cut some of these handling costs as much as 50% in specific cases. For over 20 years hundreds of TOWMOTORS have been making money for their owners in all types of industries. Small wonder the nation's largest specialists in material handling use more TOWMOTORS than any other make.

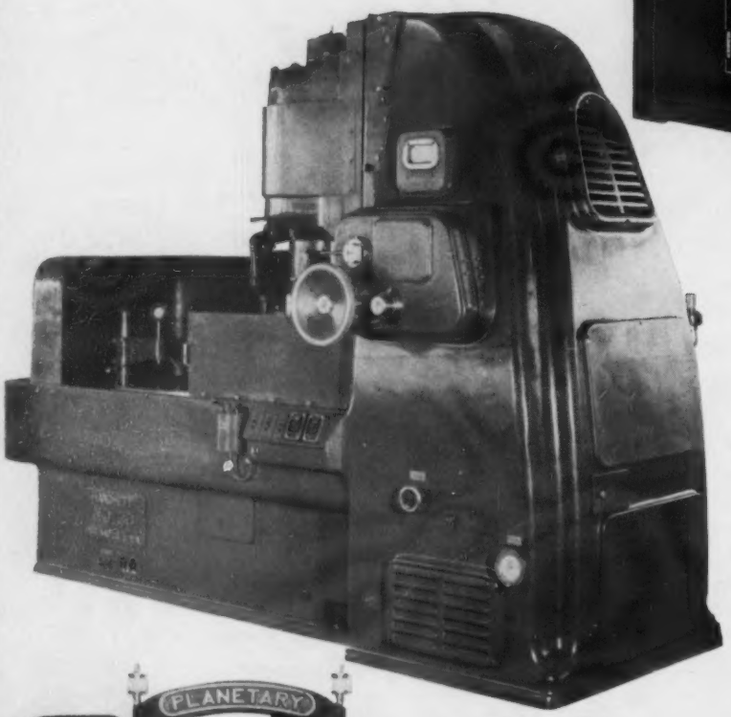
Let TOWMOTORS release your labor for more *productive* work and help cut that 56% handling cost from source to consumer. Get your copy of action picture bulletin 16 now.

TOWMOTOR CO., 1247 E. 152nd St., Cleveland, Ohio

VERSATILE *New Machines*







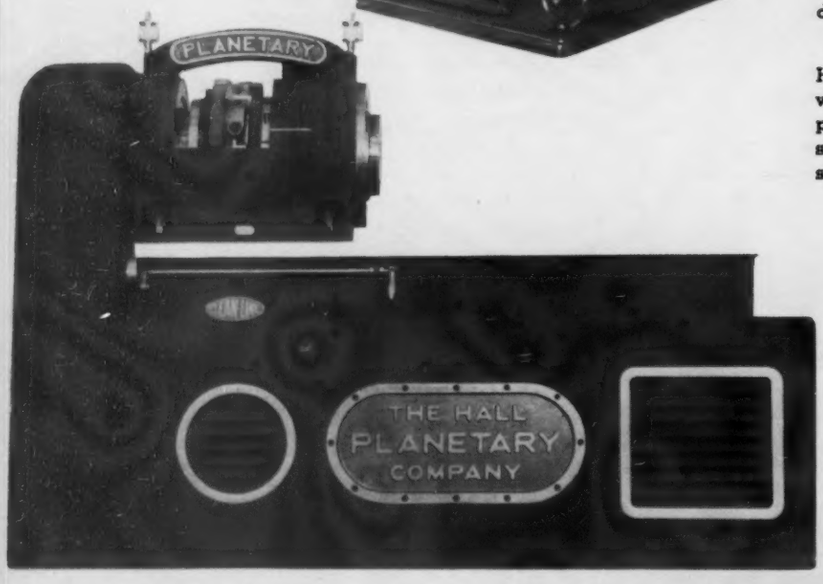
Gray maximum service planer, below, has a variable-voltage drive in conjunction with a 5 to 1 all-helical gear train which affords both cutting and return speeds from 8 to 240 feet per minute. Fifty round trips per minute possible. G. A. Gray Co., 3611 Woodburn avenue, Cincinnati

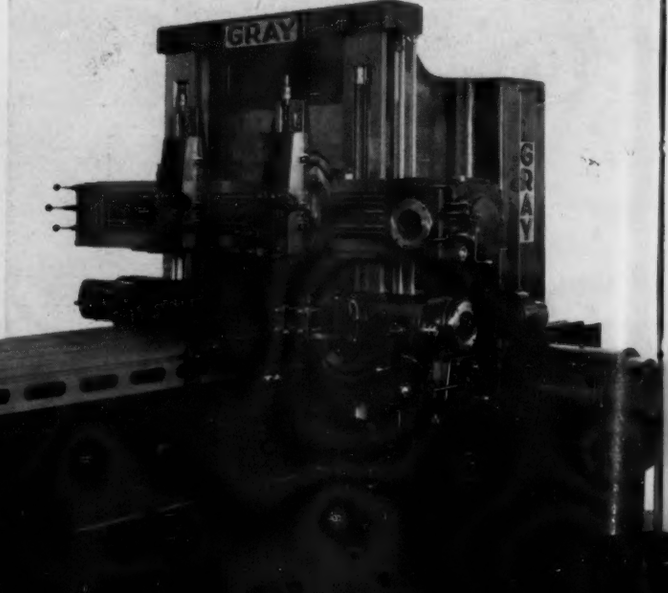
Grob NS-24 band sawing and chain filing machine, above left, with a 24-inch throat, 24 x 25-inch work table and 12⅜-inch die space. Pulleys have inlaid rubber bands and file chain groove side by side. Welder for butt welding is mounted in column. Grob Brothers, Grafton, Wisc.

Hall Planetary, left below, through planetary action accomplishes rapid machining and threading of difficult work to exacting limits of accuracy. Hall Planetary Co., Fox street and Abbotsford avenue, Philadelphia

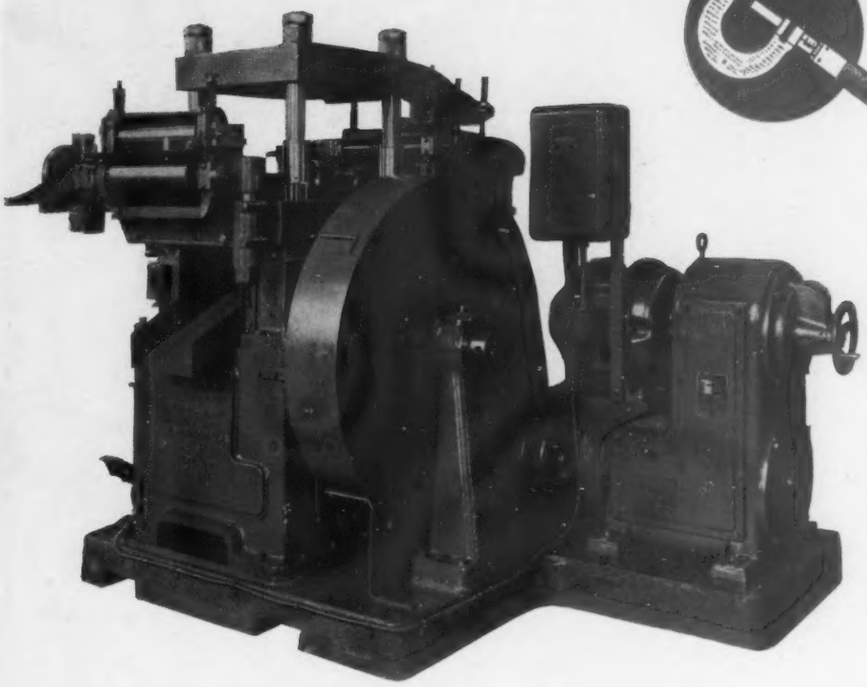
Hanchett No. 36 rotary vertical spindle surface grinder, left, has a 20-inch segmental type grinding wheel and a 36-inch diameter magnetic table. Hanchett Mfg. Co., Big Rapids, Mich.

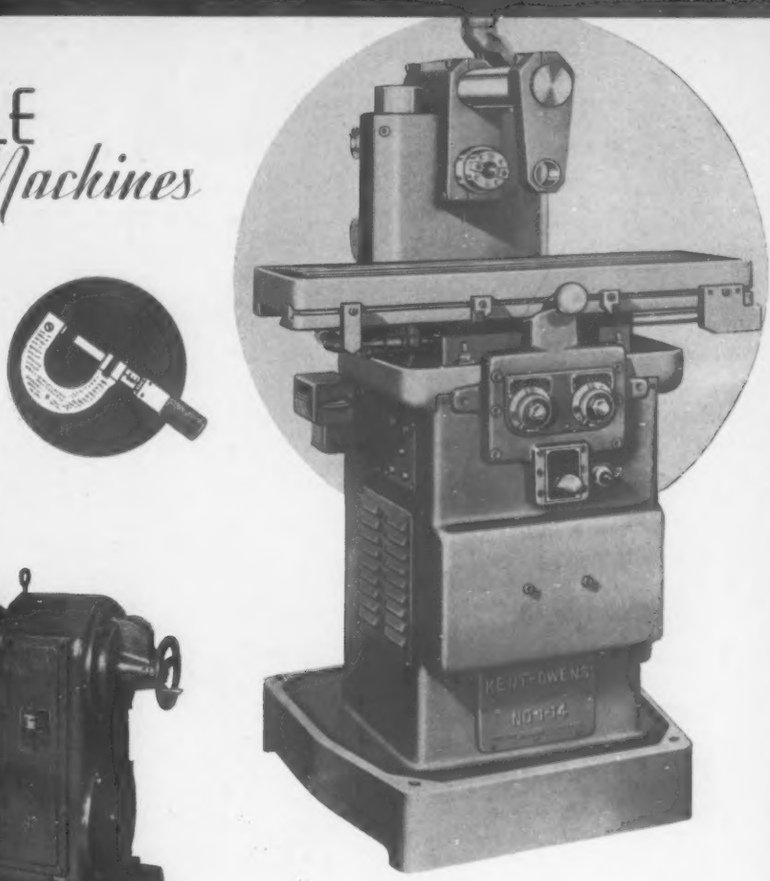
Haskins 2-C air controlled tapping machine, above right, with foot pedal to start and stop tapping cycles. Compressed air furnishes pressure for tapping and reverse strokes of tap head. Capacity is from No. 8 to $\frac{5}{16}$-inch in steel and ⅜-inch in brass. R. G. Haskins Co., 615 South California avenue, Chicago





VERSATILE *New Machines*



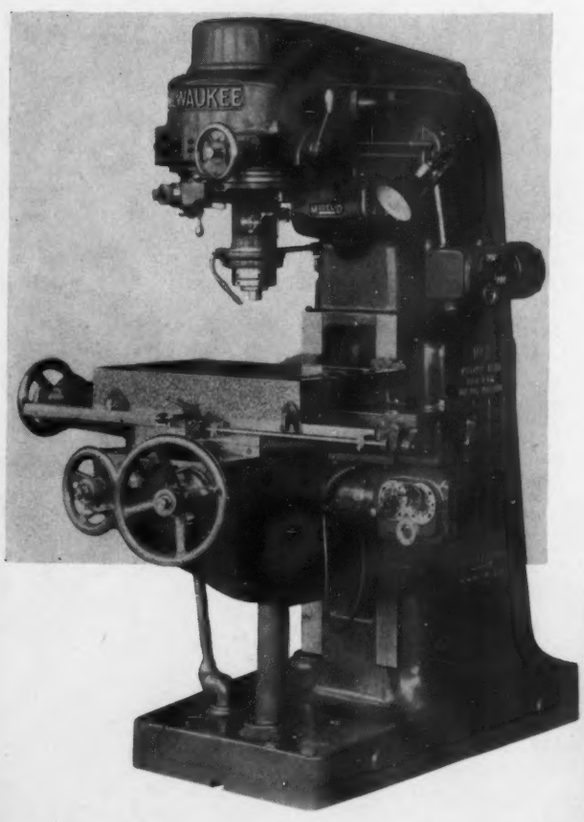


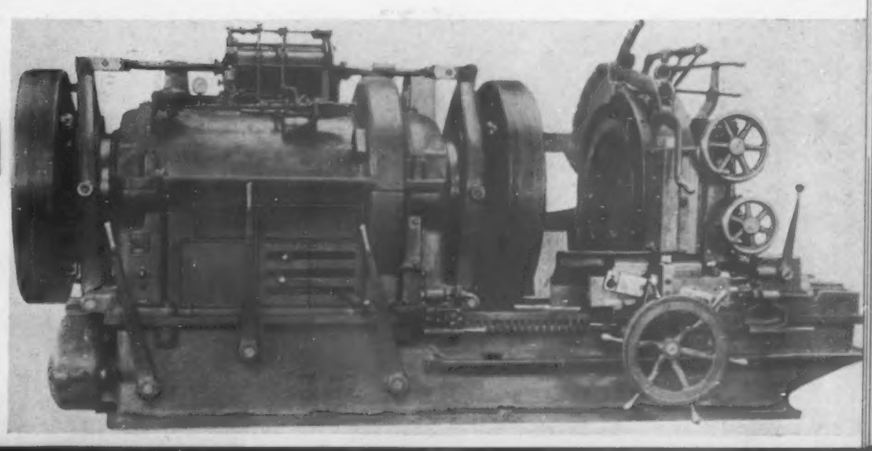
Henry & Wright 50-ton dieing machine, upper left, has a speed range of 100 to 300 strokes per minute and a new variable speed drive making possible a quick change of speed. Henry & Wright Mfg. Co., Hartford, Conn.

Kearney & Trecker rotary head tool and die milling machine, lower left, allows complete die milling at one setting of work. Planetary motion combined with cherrying attachment is capable of generating a complete sphere. Spindle speeds range from 250 to 6000 revolutions per minute and vertical power feed has 8 changes from 0.0002 to 0.008-inch per revolution. Table size is 16 x 30 inches. Kearney & Trecker Corp., 6784 West National avenue, Milwaukee

Kent-Owens 1-14 milling machine, above, is equipped with a self-contained hydraulic control panel having two feed rate dials, table movement indicator and positive stop switch. Machine has a 9 x 32-inch table, 14-inch table travel and a fully automatic cycle. Kent-Owens Machine Co., Toledo, O.

Landis 13⅜-inch receding chaser pipe threading machine, below, will cut threads well within A.P.I. tolerances. Capacity range is 8⅛ to 13⅜ inches and down to 4½ inches with auxiliary chase holders. Landis Machine Co., Waynesboro, Pa.

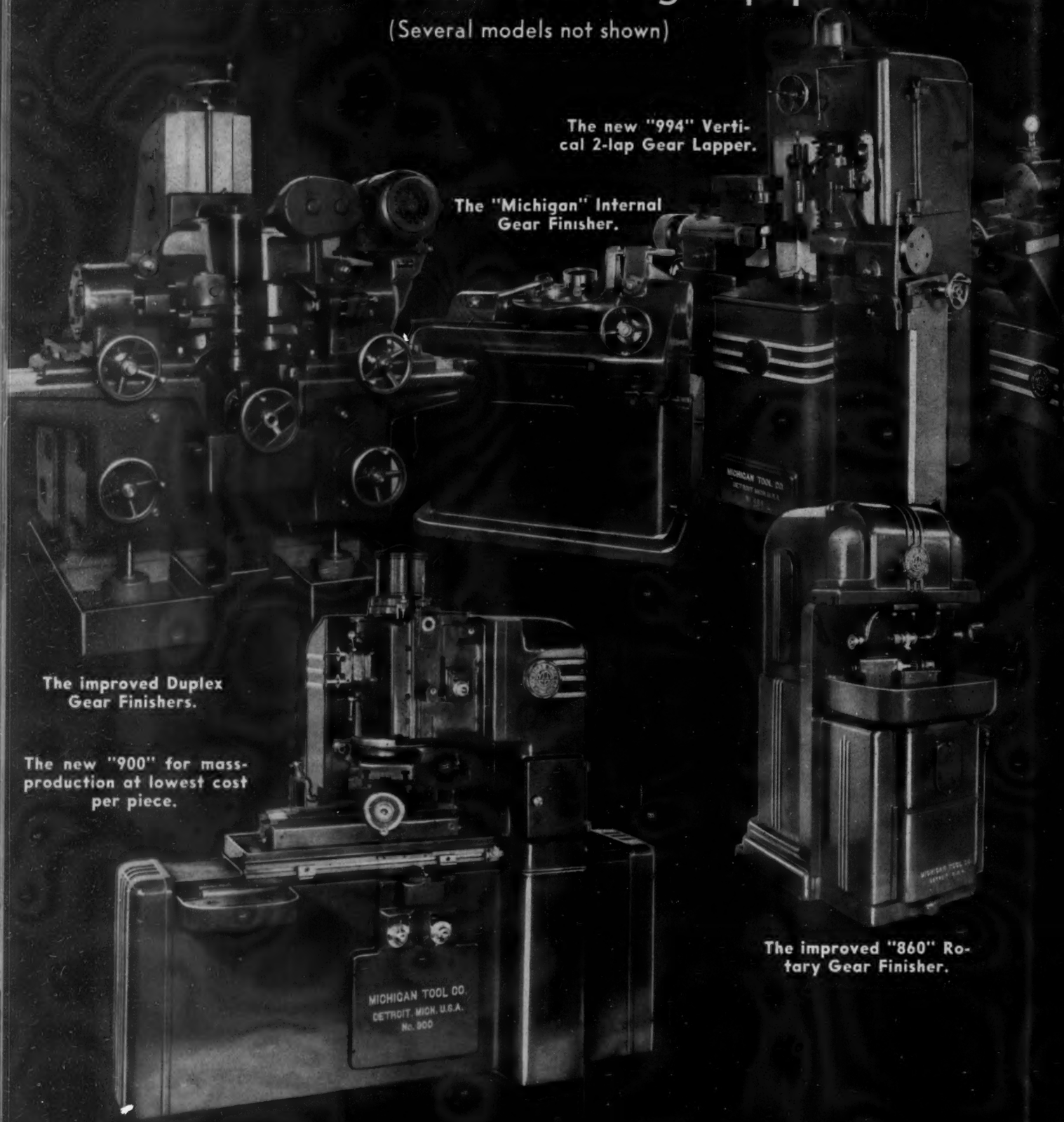




You Won't Find These

The Complete New Line of "Michigan" Gear Finishers, Gear Lappers and "Sine-Line" Gear Checking Equipment

(Several models not shown)



The new "994" Vertical 2-lap Gear Lapper.

The "Michigan" Internal Gear Finisher.

The improved Duplex Gear Finishers.

The new "900" for mass-production at lowest cost per piece.

The improved "860" Rotary Gear Finisher.

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See them in Detroit *

The New "995" Horizontal 2-lap Gear Lapper.

Improved, faster, "Sine-Line" Lead Checker.

The "Michigan" Gear Speeder.

The improved "Sine-Line" Involute Checker.

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The "860A" Rotary Gear Finisher for job lots.

Stop off at Detroit coming or going and call SLocum 9030

A car will pick you up at your hotel. See machines in operation.

Ask us about "Curve-Shaving" and "Cone-Drive" Worm Gearing.

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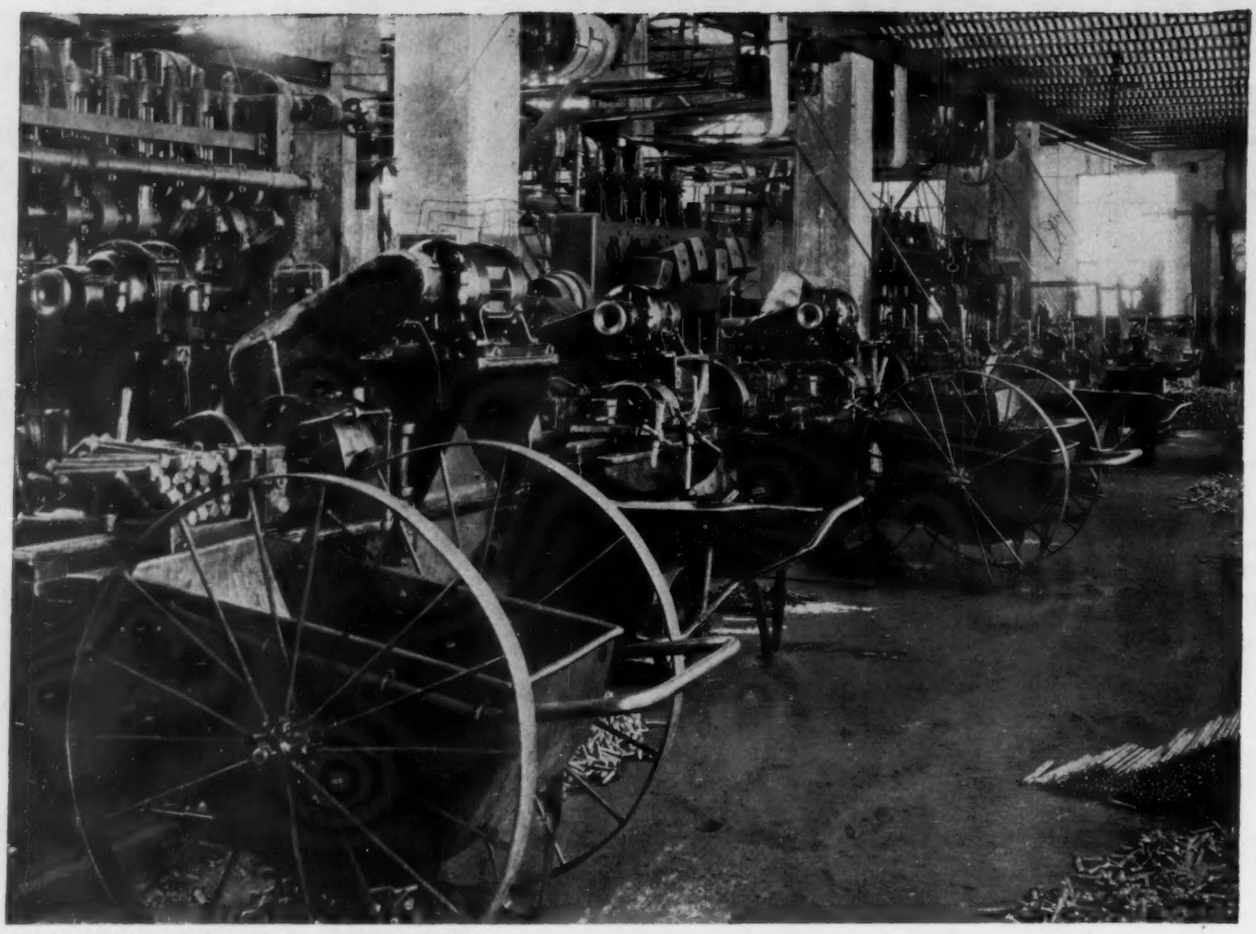

Photograph by courtesy of La Consolidada, Mexico.

In the Interests of Modernization—

Mexico's finest Bolt and Nut Plant—La Consolidada—is equipped with LANDIS Die Heads and Threading Machines.

La Consolidada produces over 27,000 different sizes and lengths of bolts. The above illustration shows only a few of the Landis Threading Machines employed to maintain production facilities for the unusually wide variety of threaded products.

—for *modern* production requirements—accurate threads and low threading costs—modernize with Landis—LANDISize your Threads.

For further information write us today.

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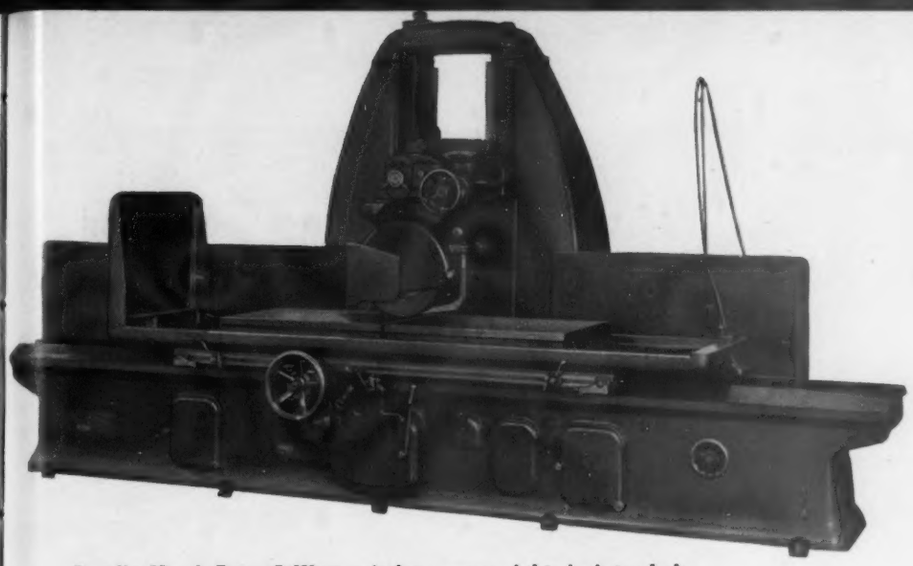


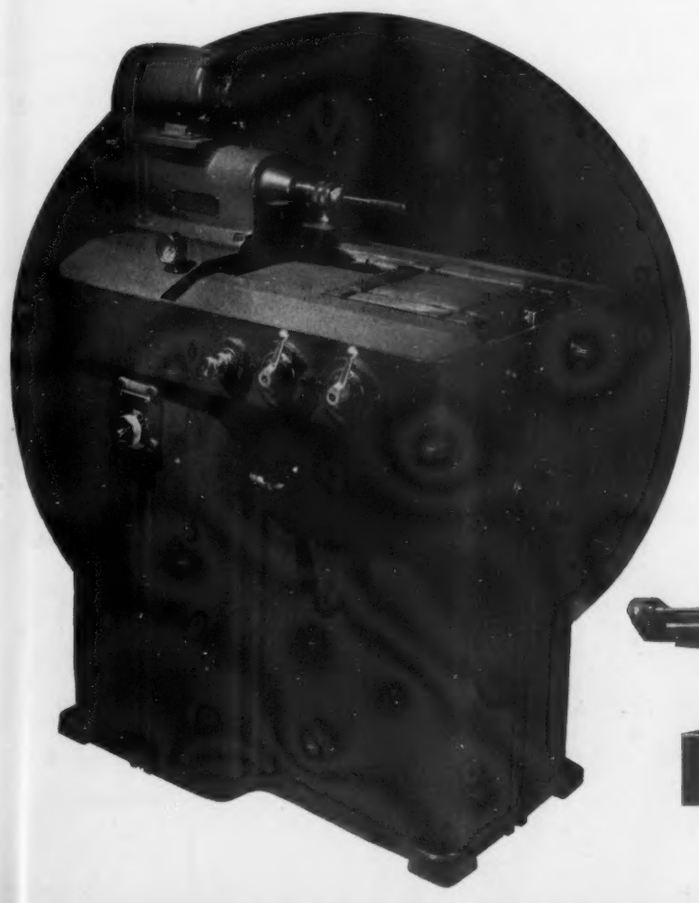
Landis No. 1 Race-A-Way grinder, upper right, is intended for production grinding of small raceways of ball bearings up to and including the No. 204. Landis Tool Co., Waynesboro, Pa.

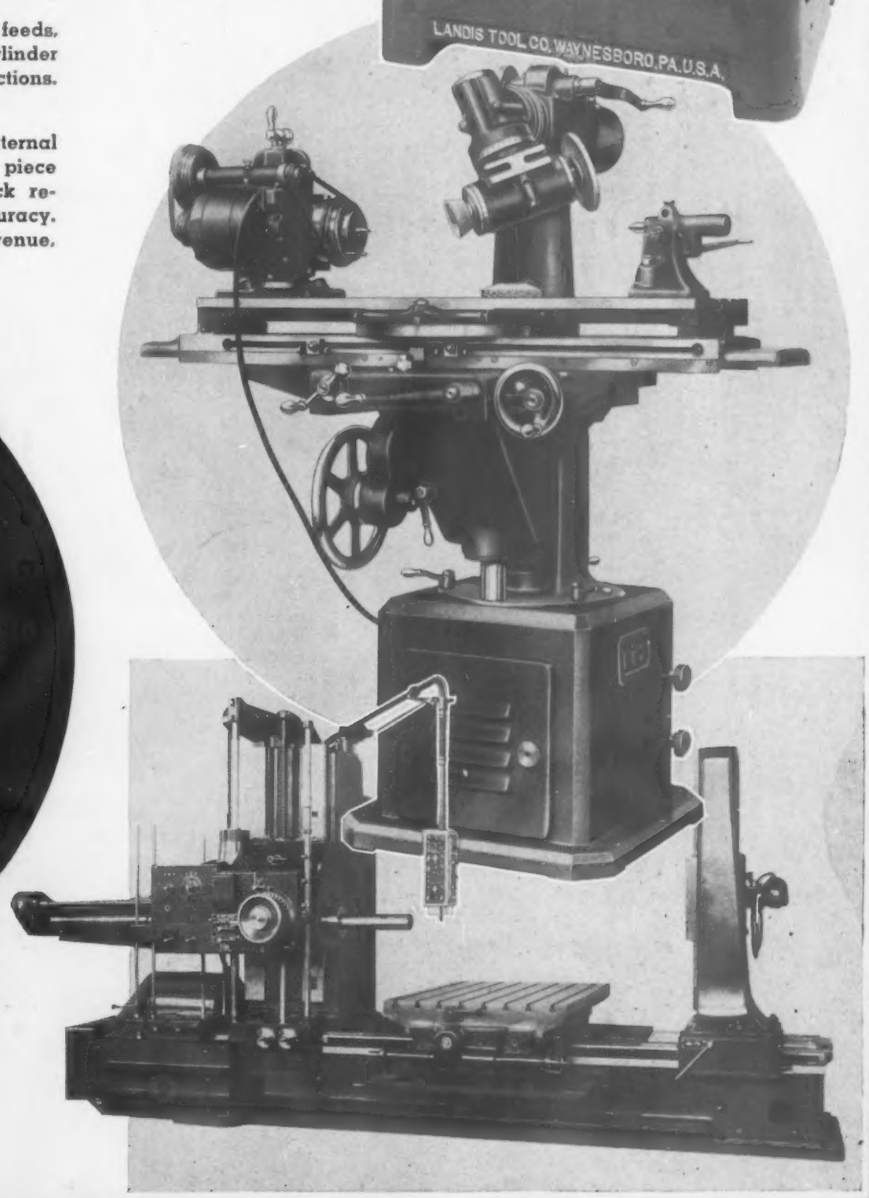
LeBlond No. 3 universal cutter grinder, in circle at right, has a universal table which makes possible placing work to grinding wheel in any position or angle R. K. LeBlond Machine Tool Co., Madison and Edwards roads, Cincinnati

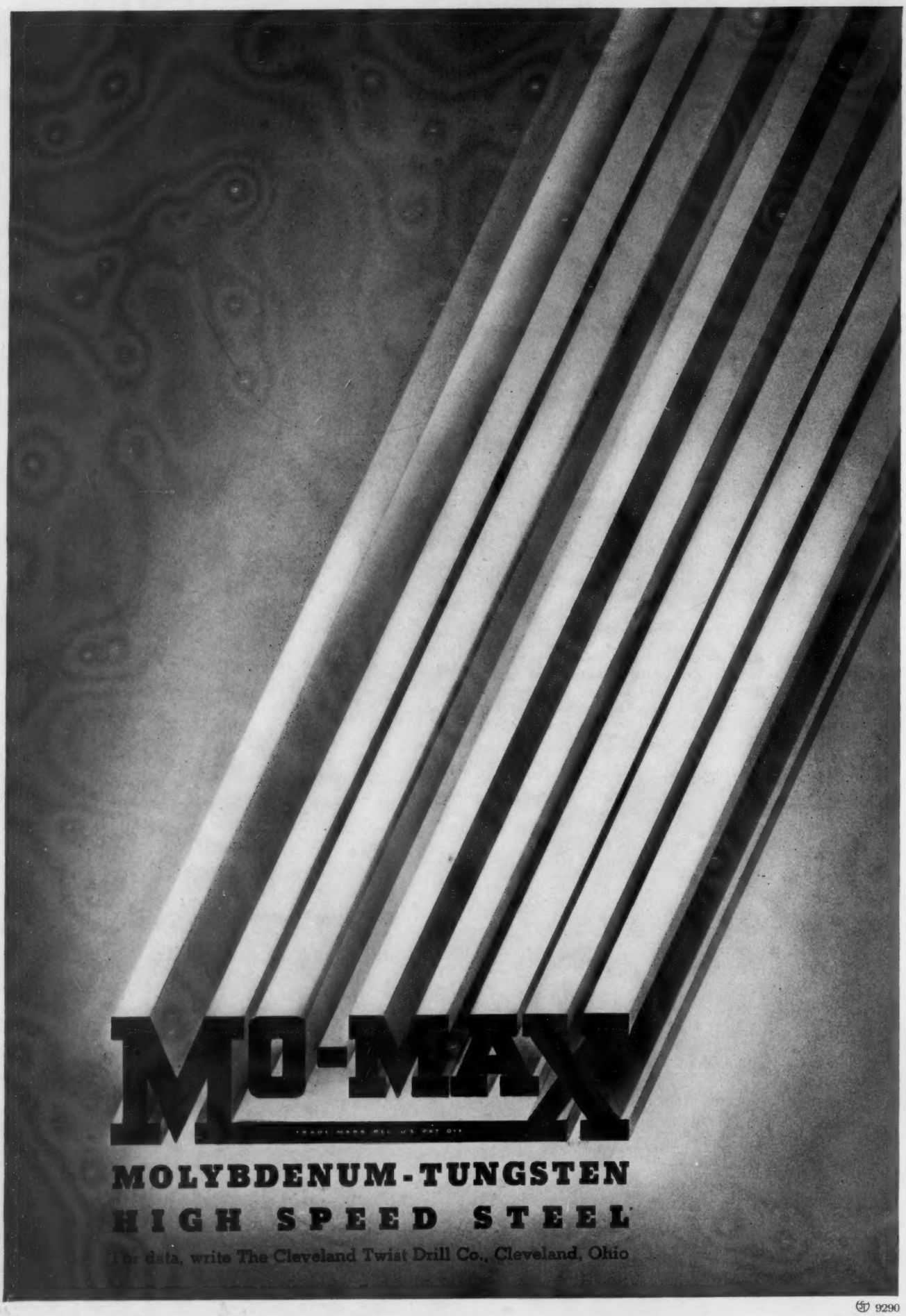
Lucas No. 436 horizontal boring, drilling and milling machine, below right, with multi-position electric pendant directional control for spindle rotation and traverse of all sliding units. Table has crosswise jump feed to expedite milling of interrupted surfaces. Lucas Machine Tool Co., 523 East Ninety-ninth street, Cleveland

Mattison precision surface grinder with hydraulic feeds, above, has table driven by a nondifferential, twin cylinder hydraulic drive providing equal speeds in both directions. Mattison Machine Works, Rockford, Ill.

Micromatic Hydrohoner, below, for internal and external finishing of small-diameter cylindrical work where piece may be rotated. Machine features substantial stock removal, uniform diameter size, low tolerance accuracy. Micromatic Hone Corp., Dubois street and Horton avenue, Detroit



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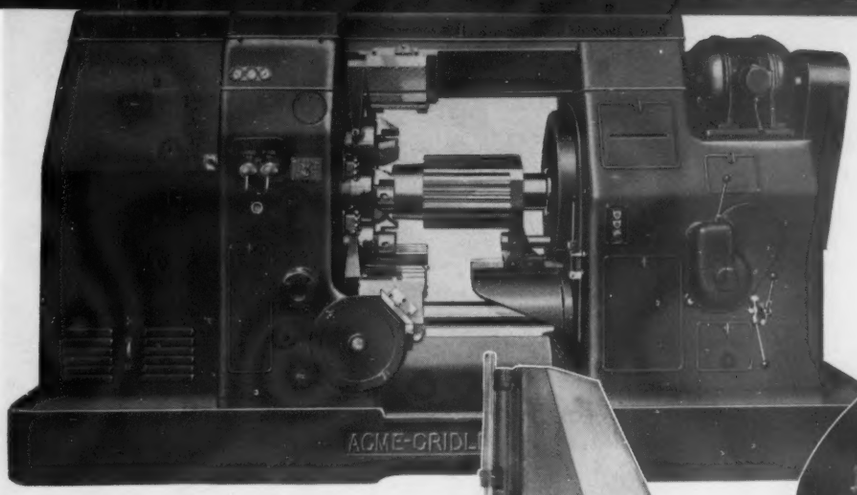
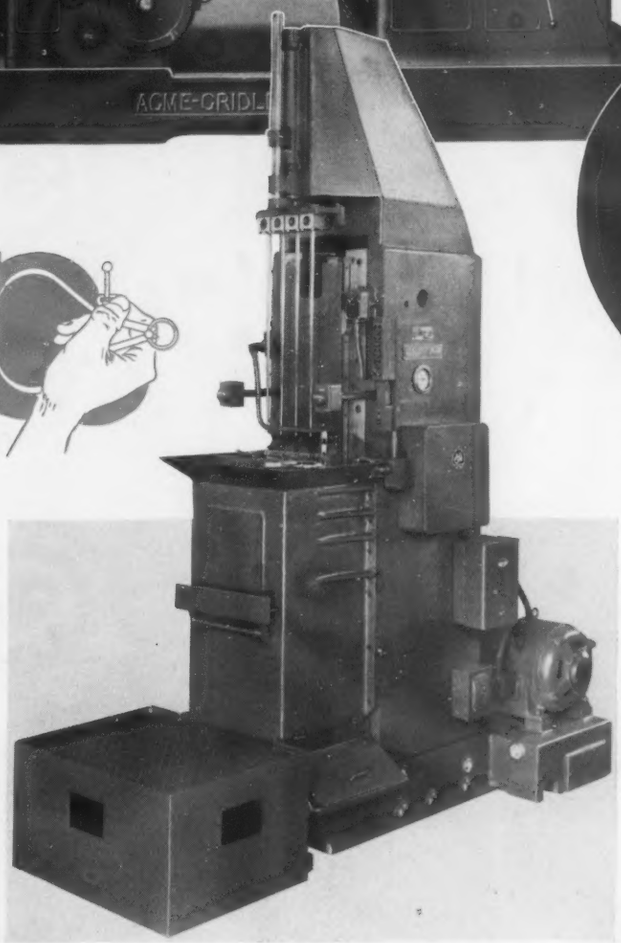
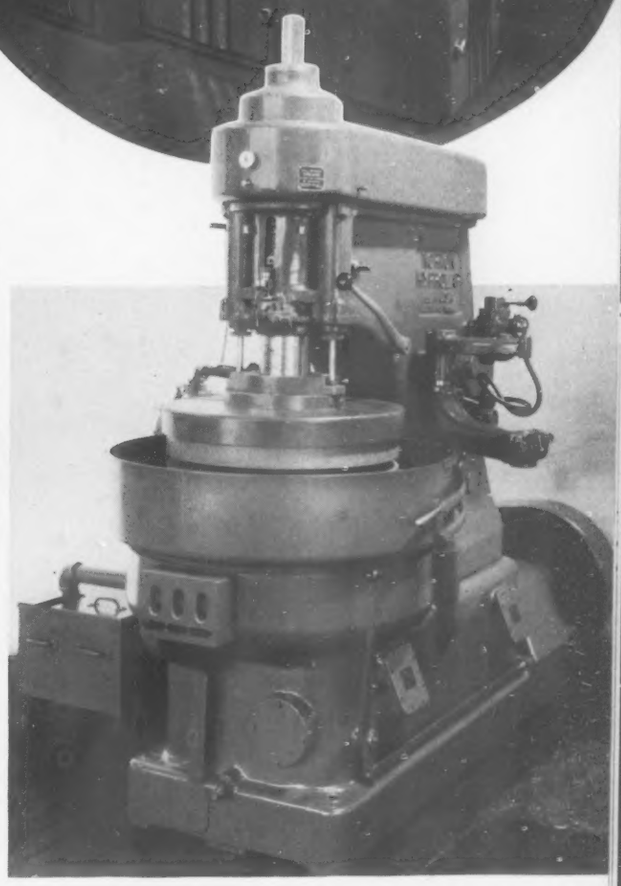
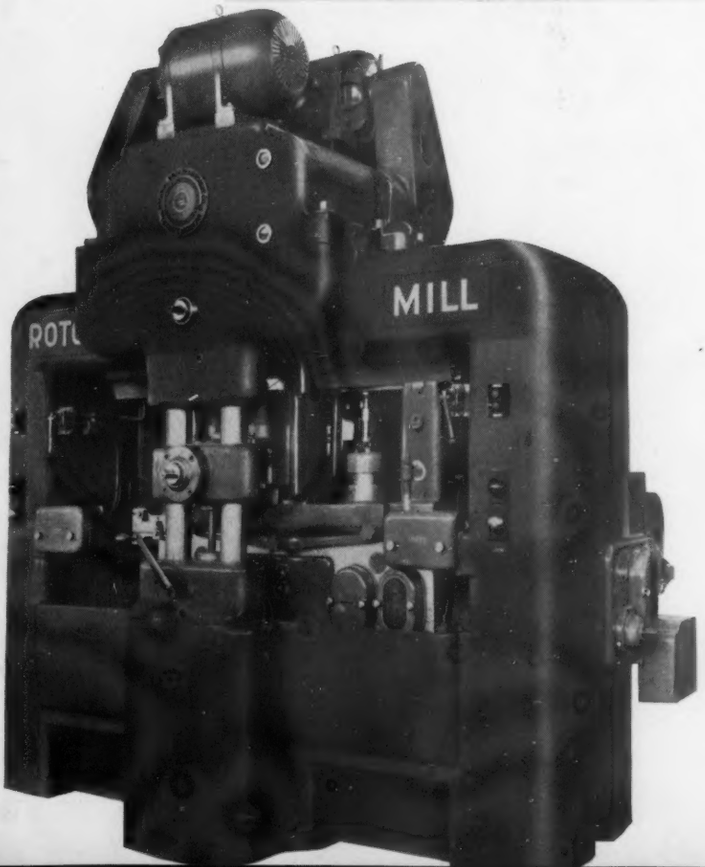
For data, write The Cleveland Twist Drill Co., Cleveland, Ohio

VERSATILE *New Machines*









Monarch 12 x 30-inch tool makers' lathe, oval top right, is powered with a new type alternating current adjustable speed drive giving spindle speeds from 15 to 1500 revolutions per minute. Monarch Machine Tool Co., Sidney, O.

Acme-Gridley 12-inch model RPA 30-ton six spindle chucking machine, top left, has mechanical feeds, and hydraulic chuck and spindle control. National Acme Co., 170 East 131st street, Cleveland

National Broach Rotomill, left, will machine any type of cylindrical, conical or flange-type work. Cutters have 50 to 100 teeth and cutter load is equalized. National Broach & Machine Co., Shoemaker and St. Jean streets, Detroit

Norton No. 26 Hydrolap, immediately above, uses two bonded abrasive laps and will finish a number of parts simultaneously in one load depending on their size. Norton Co., Grinding Machine division, Worcester, Mass.

Oilgear type XD vertical pulldown broaching machine, center left, features automatic tool handling, automatic puller. Oilgear Co., 1403 West Bruce street, Milwaukee

THE BIRTH OF A BEARING

FAFNIR

The father of a few children who amount to something has done mankind a greater service than the father of thirteen, if he aims most of his brood toward reform school.

It's the same way with ball bearings. An over-zealous bearing manufacturer, at the whims of an over-anxious bearing user, can produce a lot of unhappy "children"....

Bearings whose place in the world of industry is so limited that, from birth, they're headed for an early death or quick reform.

Fafnir measures completeness of line in *usefulness* rather than numbers alone. That is why the birth of a bearing is important at Fafnir, for each new arrival is destined for a key place in a big, healthy, successful family.

Glance at the Fafnir literature shown at the left. See how the Fafnir line—*the balanced line—most complete in America* — is divided. Not into thousands of individual designs of limited application, but into carefully-planned groups of bearings, each designed to serve a given industry — and serve it completely.

The Engineering Catalog covers the Fafnir standard line — complete in range of types and sizes — which eliminates in nine cases out of ten the cost, delay and grief that goes with designing a special bearing. And Fafnir's specialized lines, proved in performance, provide bearings ready to go to work in specialized applications — and to deliver.

It takes only a few seconds now to get acquainted with these Fafnirs. Select, on the opposite page, the descriptive literature you want, and write to the Fafnir Bearing Company, New Britain, Connecticut.

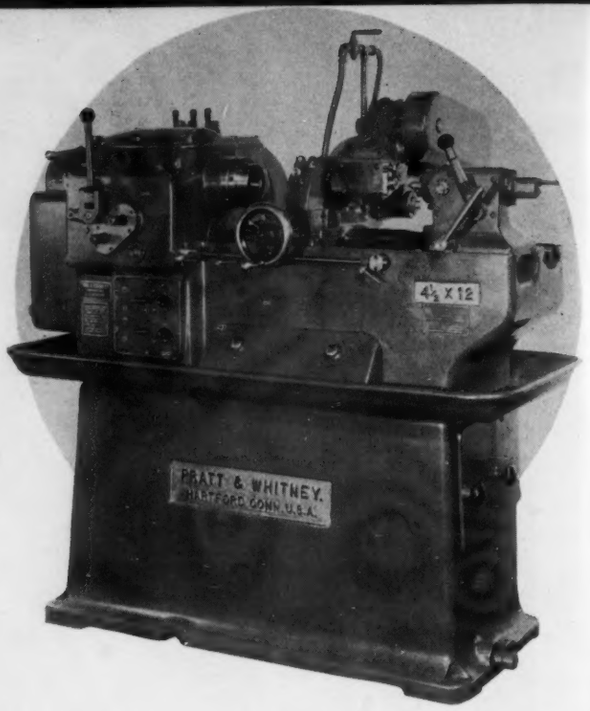
BALANCE IN DESIGN

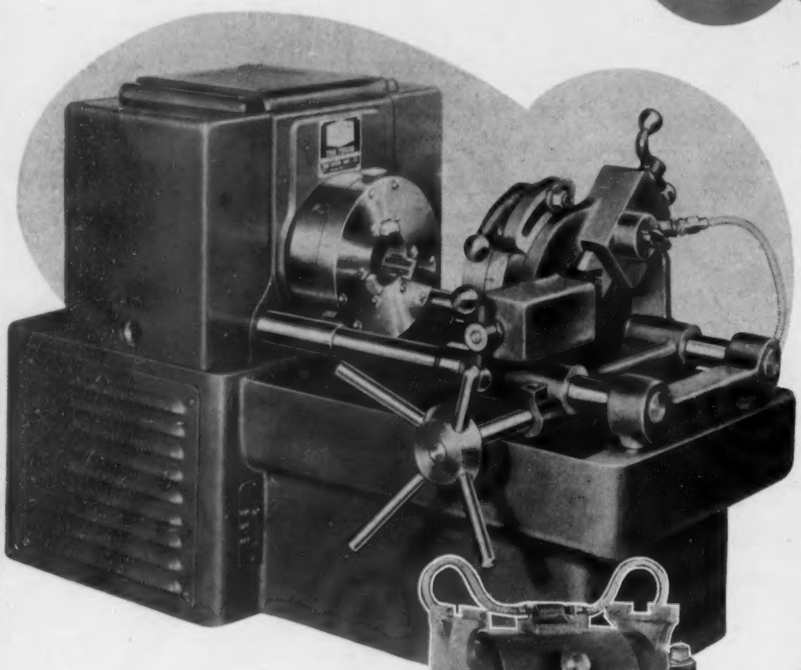
In ball bearing design, ball size, race depth and ring thickness determine life and capacity.

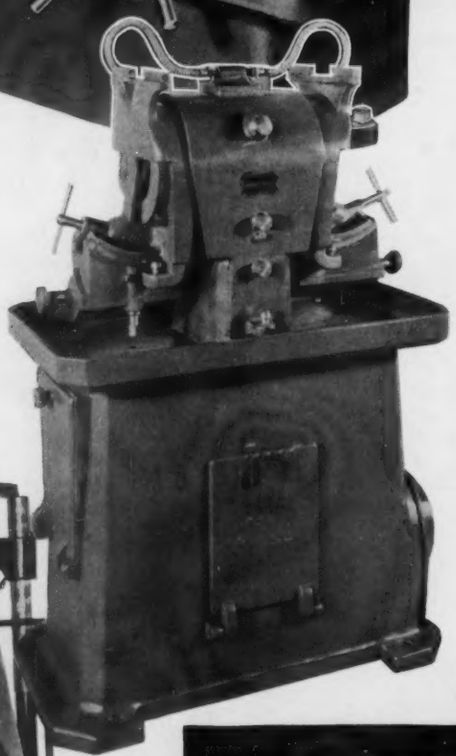
Fafnir's larger balls carry greater load; make fewer revolutions per bearing revolution, with resultant longer life. Fafnir's deeper races also increase load capacity, and provide thrust capacity to a degree unusual in a radial bearing.

Every Fafnir Ball Bearing has been developed to the point where high capacity and long life are inherent attributes of a perfectly balanced design.

VERSATILE *New Machines*







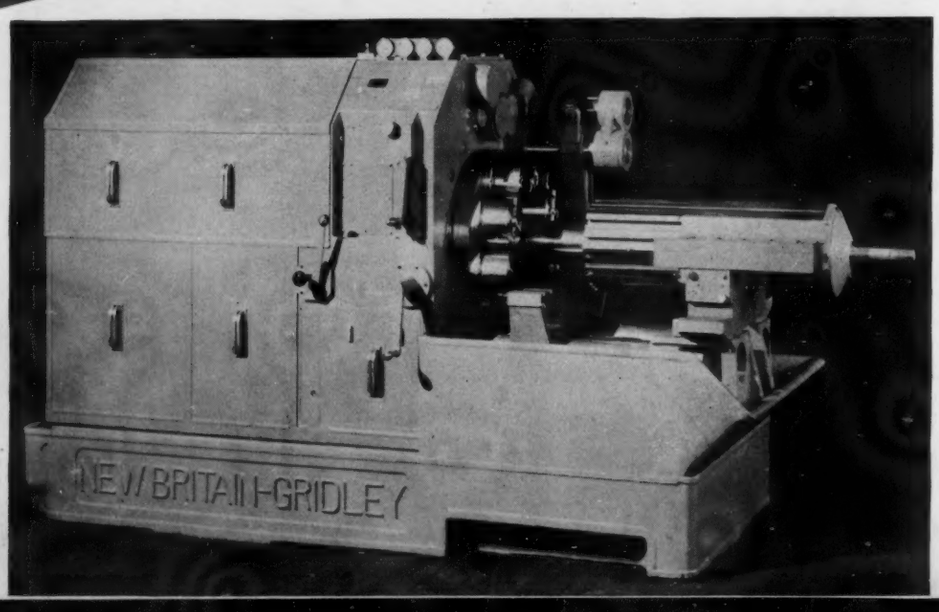
New Britain six spindle work rotating automatic chucking machine, below, features open end construction providing accessibility, automatic spindle carrier lifting mechanism, swinging forming arms with no exposed bearing surfaces and positive drive synchro-mesh spindle clutches. New Britain Gridley Machine division, New Britain Machine Co., New Britain, Conn.

Oliver template tool bit grinder, immediate left, automatically produces any shape on a regulation tool bit up to ¾-inch square. Oliver Instrument Co., Adrian, Mich.

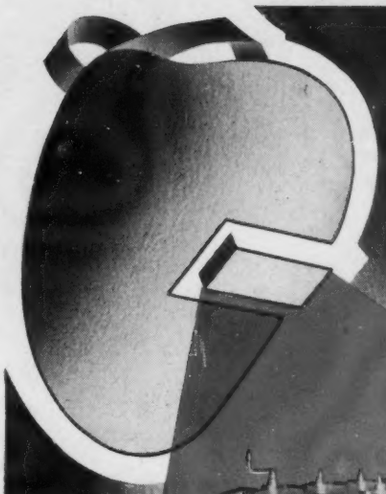
Oster No. 562-A Tom Thumb portable pipe machine, top left, has a capacity from ½ to 2 inches with a universal gripping capable of holding pipe as short as 2½ inches without use of nipple chuck. Machine also will drive geared die-stock up to 8 inches capacity through a special universal shaft. Oster Mfg. Co., 2057 East 61st place, Cleveland

Porter-Cable model B-6 Wet-r-Dry sander-grinder, left below, runs with abrasive belt speeds of 2500, 3500 and 4500 feet per minute. Belt is enclosed except at operating point. Machine will take belts ½ to 3 inches in width. Waterized unit has spray jet above and below table. Porter-Cable Machine Co., Syracuse, N. Y.

Pratt & Whitney 4½ x 12-inch model C thread miller, above, shown here for the first time, gives increased speed and accuracy on wide range of production threading operations. Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford, Conn.



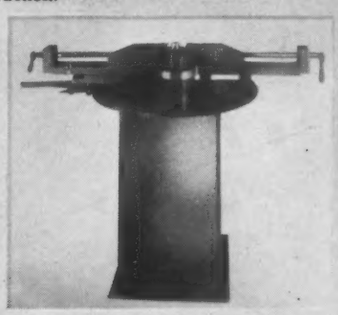
SEE HOW YOU PROFIT *with* WELDED DESIGNS



QUICKER DELIVERY—SEE how welded designs cut production time. For example, the base of Yoder cold roll forming machines are produced in 5 or 6 days as compared to 12 to 18 days with former construction. Weight saving is 33%. Cost of finished welded base equals cost of patterns alone used for former construction.

IMPROVED APPEARANCE—SEE how tools have been improved in appearance as well as in performance with welded steel construction. Example: This new model South Bend Lathe on welded steel bench.

LOWER COST—SEE how welded designs such as this Doall Metalmaster give the buyer better machines at less cost. This all-welded machine sells for 33% less, weighs 25% less and has 2" greater throat capacity than the previous model.



REDUCED WEIGHT—SEE how welded steel has reduced the weight of tools and made them more rigid and practically unbreakable. This Wallace Bender weighs 736 lbs. as compared to 1250 lbs. for the former construction, cutting shipping costs and simplifying installation.

IMPROVED PERFORMANCE—SEE how rigid, one-piece, all-welded frames of machines give superior performance. This frame of a Sturdybender bending press takes the heavy loads with minimum deflection, saving power and avoiding wear on ways and bearings.

GREATER PROFIT—SEE how *you* can cut costs and improve *your* products with welded steel construction!

Engineers in the nearest Lincoln office—experienced in all phases of welding production—are at your service. Call them or write—

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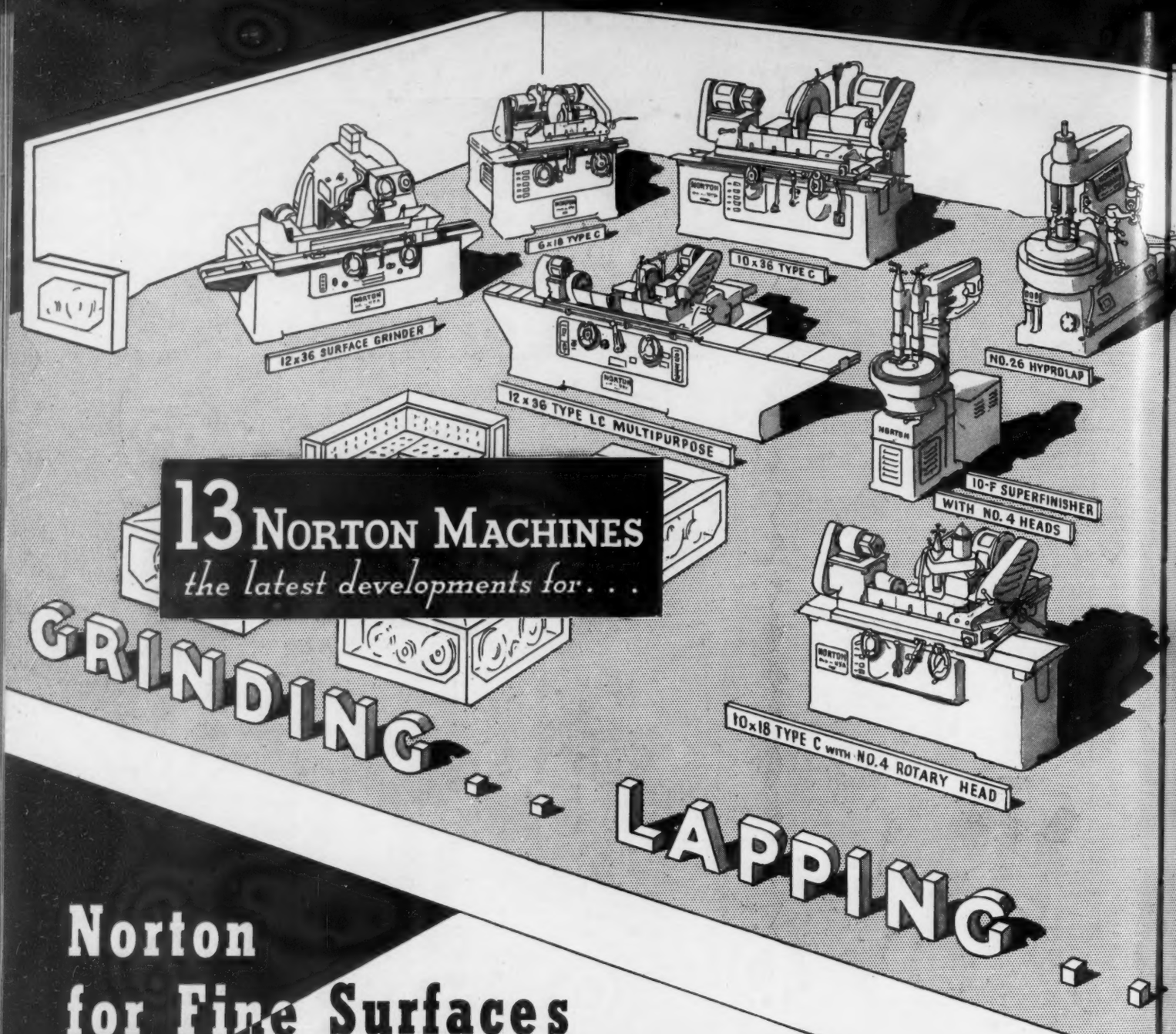
6x18 TYPE C
10x36 TYPE C
12x36 SURFACE GRINDER
NO. 26 HYPROLAP
12x36 TYPE LC MULTIPURPOSE
10-F SUPERFINISHER
WITH NO. 4 HEADS
10x18 TYPE C WITH NO. 4 ROTARY HEAD
13 NORTON MACHINES
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GRINDING . . LAPPING

Norton for Fine Surfaces and High Production Accuracy

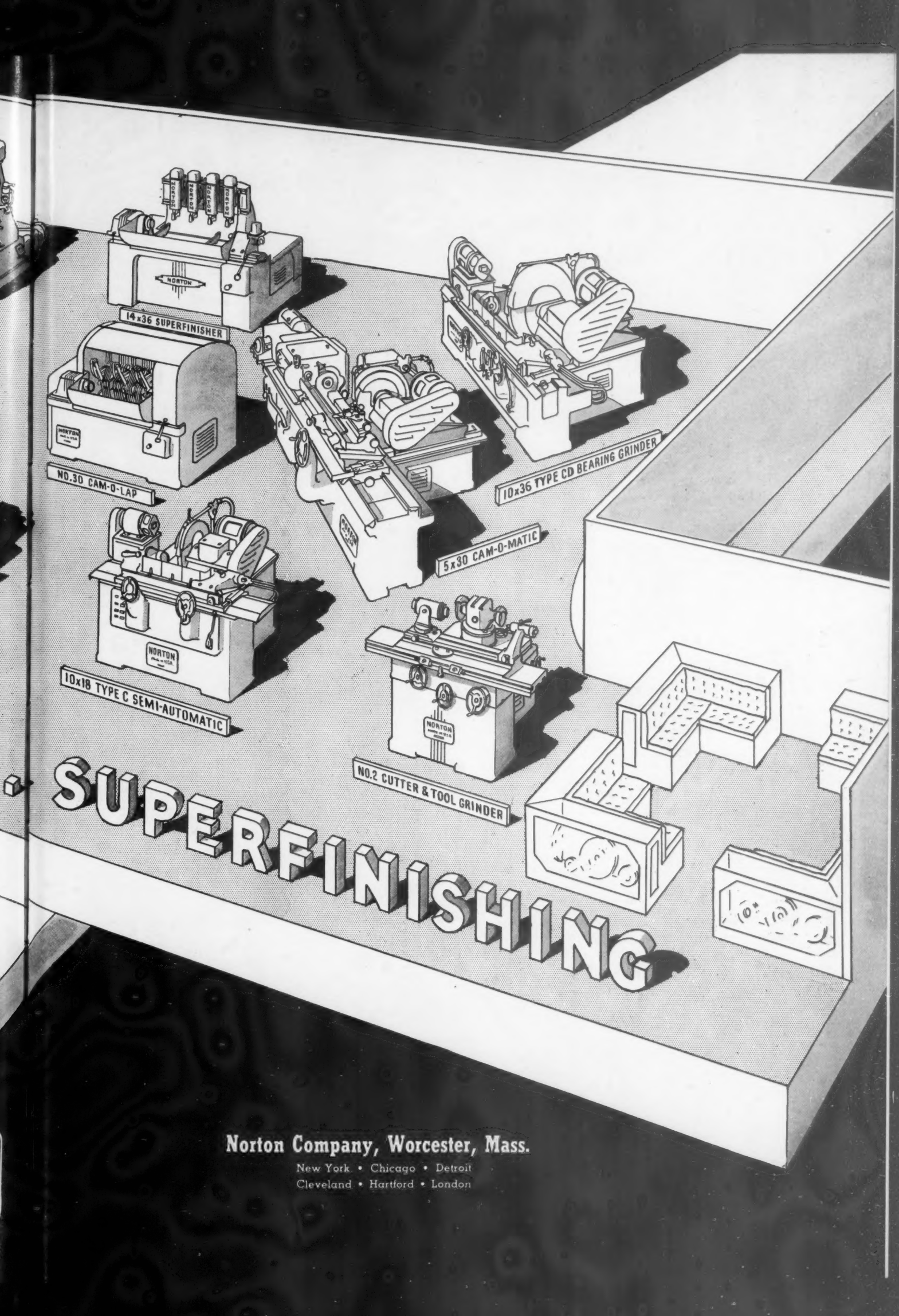
Eight Grinding Machines -- (four cylindrical, a crankshaft bearing, a camshaft, a multi-purpose and a surface) with kerosene lubricated wheel spindles — an outstanding advance in grinding machine technology that is increasing production and improving surface finishes. One cylindrical grinder is equipped with an auxiliary superfinishing head so that both grinding and superfinishing can be done in one set-up; a second is equipped for "still wheeling"— another method of producing exceptional surface finishes.

Two Lapping Machines -- a new model of the Hyprolap, the machine which has proved so popular for high production lapping and a semi-automatic Cam-O-Lap for lapping cam contours and bearings simultaneously.

Two Superfinishing Machines -- one for crankshaft bearings and equipped with four hydraulically operated superfinishing heads and the other for flat work and equipped with two superfinishing heads.

A Cutter and Tool Grinder -- an entirely new machine with ball bearing wheel spindle and featuring ease of control and operation.

NORTON MACHINES



Norton Company, Worcester, Mass.

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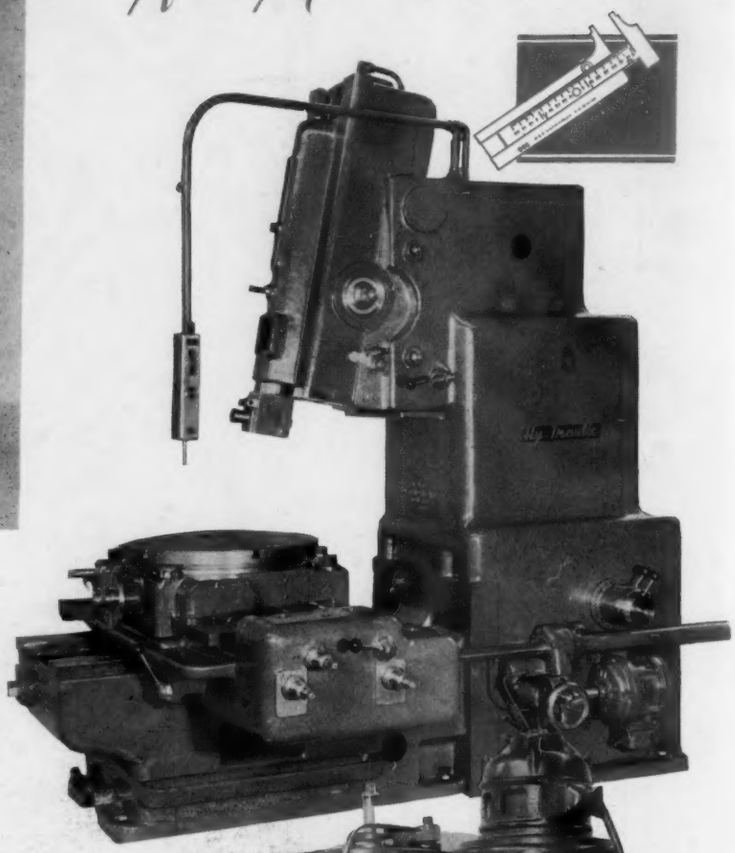


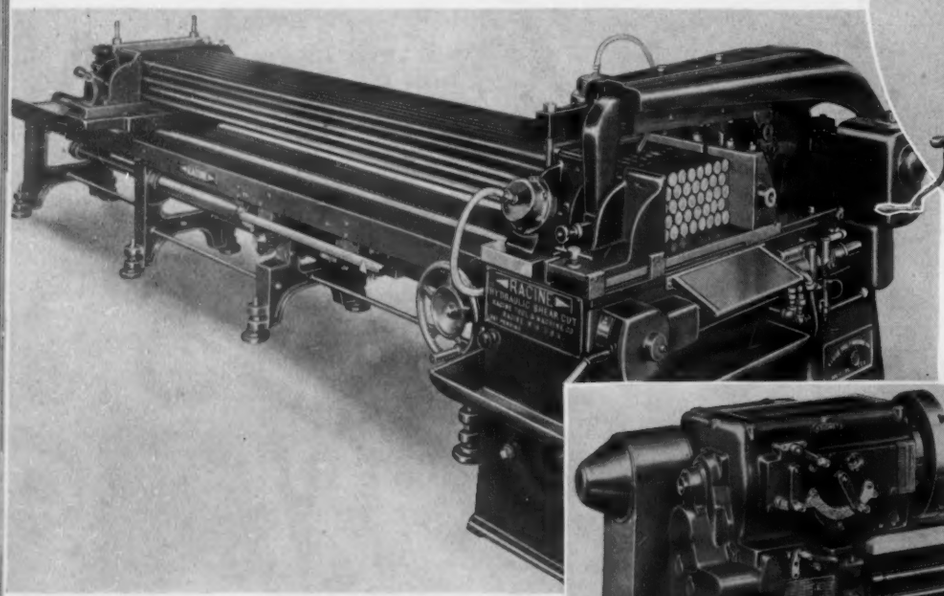
Racine No. 33-C hydraulic power saw, left below, has an automatic stock feed and hydraulic chuck. Cycle can be made automatic for any length of stock. Racine Tool & Machine Co., Racine, Wisc.

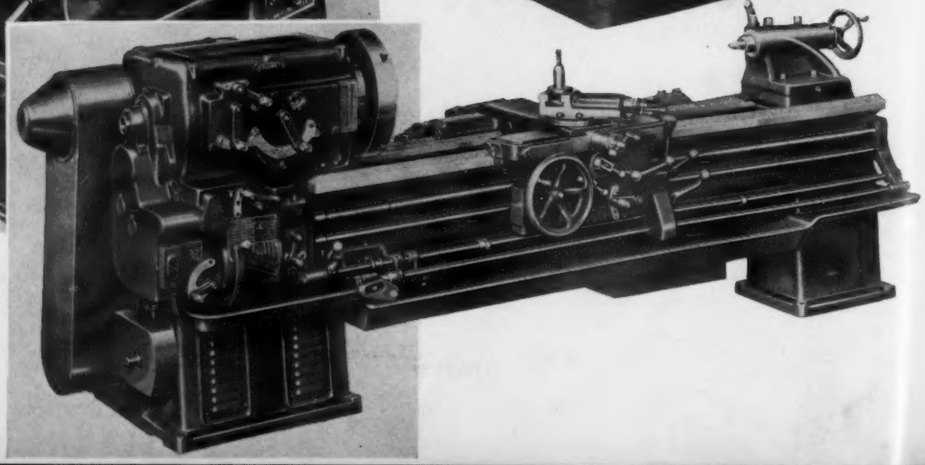
Reed-Prentice No. 3-V vertical milling and die sinking machine, just to the right below, is available in 4 ranges of speeds. For precision tool room work. Reed-Prentice Corp., Worcester, Mass.

Rivett series 1020 back-geared screw cutting enclosed head lathe on metal cabinet with unit motor drive, upper left corner, has a speed range from 20 to 500 revolutions per minute, and, with open belt, from 100 to 2500 revolutions per minute. Rivett Lathe & Grinder Inc., 18 Riverview road, Boston

Rockford 12-inch hydraulic high-speed shaper, upper right, has a stroke length from 1/2 to 13 inches and a ram speed variable in infinite steps from 5 to 150 feet per minute. Rockford Machine Tool Co., Rockford, Ill.

Sidney 18 x 72-inch center lathe, below. Automatic lubrication in headstock with centralized reservoir. Sidney Machine Tool Co., Sidney, O.





New Britain-Gridley

CUTS THE STEEL

SPEED CASE CUTS THE COST!

It will pay you to investigate the savings which can be made through the combination of up-to-the-minute tools and our modern SPEED CASE and SPEED TREAT steels.

Averages reported by hundreds of users show that X-1515 SPEED CASE steel has enabled them to increase production from 20% to 40% over the Bessemer steels, and from 50% to more than 100% over the fastest machining standard SAE open hearth steels, with corresponding increase in tool life.

SPEED CASE and SPEED TREAT steels are guaranteed to produce a stronger and better part at less cost, regardless of what standard carbon steels you are now using. Complete details will gladly be sent upon request.

• Above part made by the New Britain Machine Co., New Britain, Conn., from X-1515 Steel faster than with former use of SAE X-1112 Bessemer. Tool life showed a substantial increase and the finish was superior to the part made from SAE X-1112. SPEED CASE X-1515 steel is an open hearth case hardening grade, with fine physical properties which costs only $5.00 per ton more than SAE X-1112.

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***Manufacturers of* COLD DRAWN CARBON AND ALLOY STEEL BARS**

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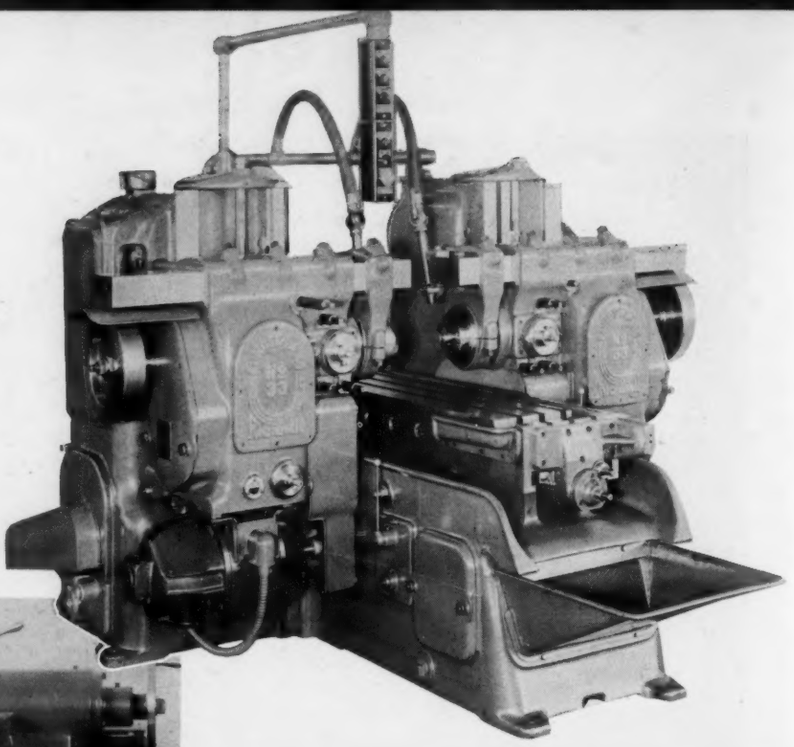
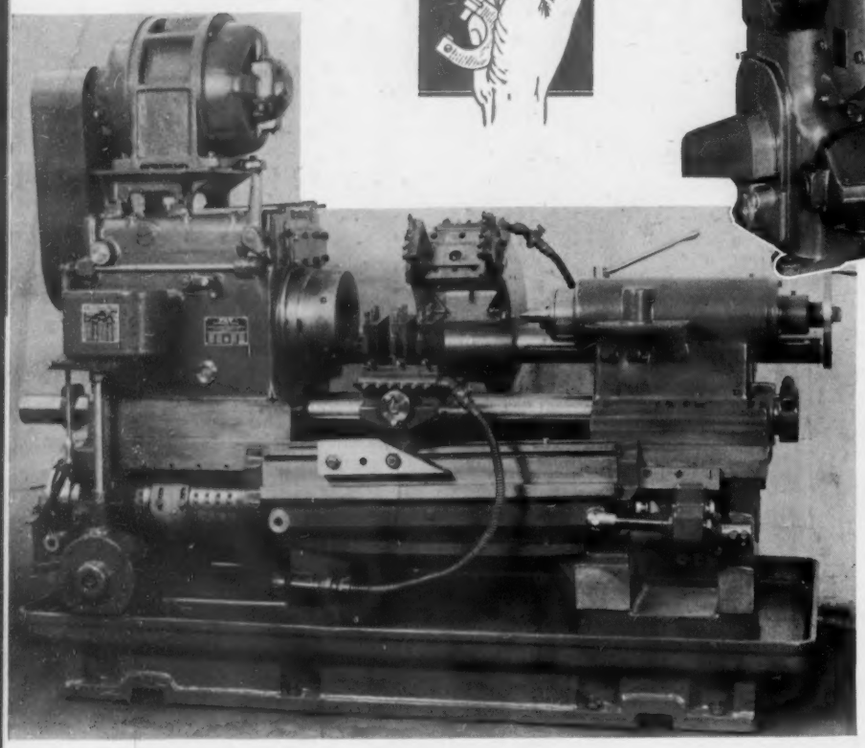
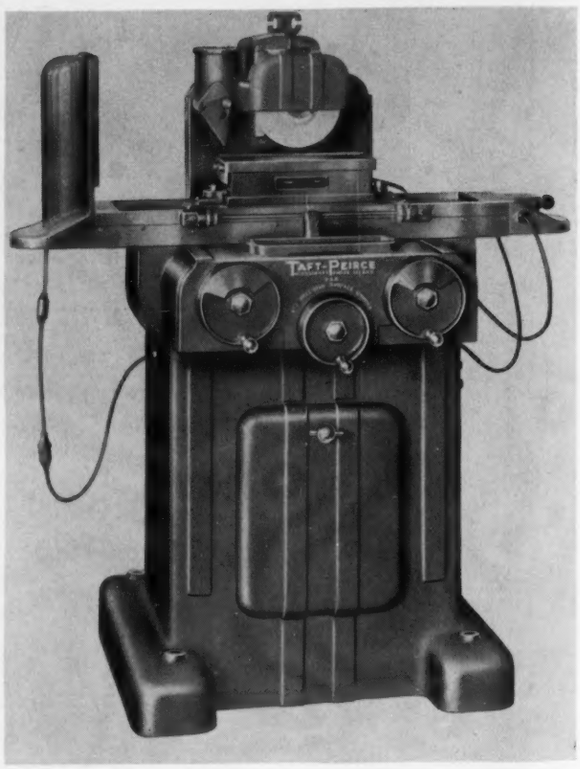
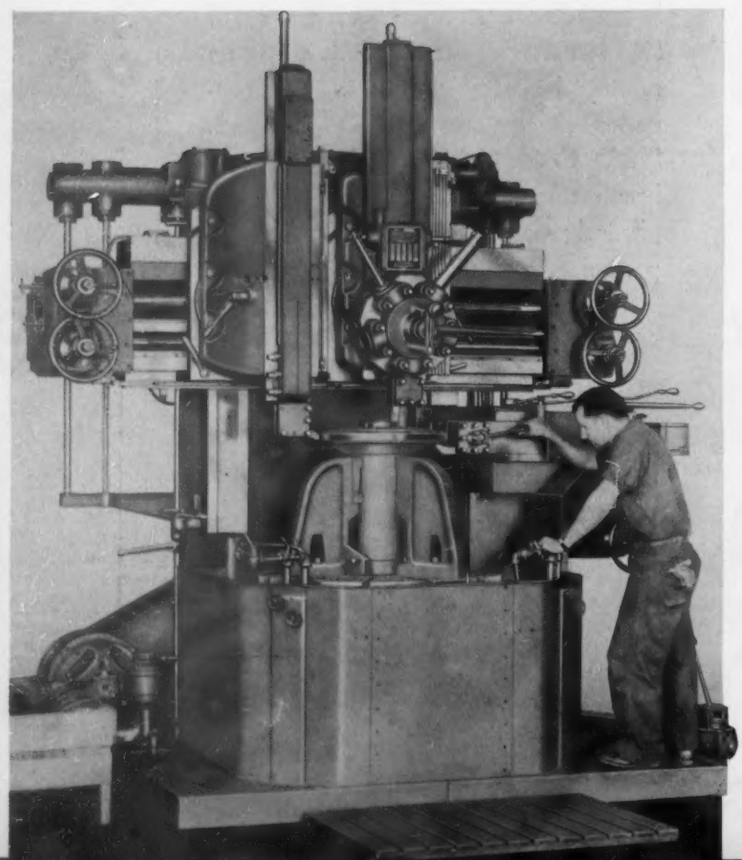








Sundstrand No. 33 Hydro-Screw Rigidmil milling machine, top, has a combination screw and hydraulic drive to the table. An infinite number of table speeds within the range of ½ to 60 inches per minute and a rapid traverse rate of 300 inches per minute are provided. Spindle head has a 30 to 1 drive. Sundstrand Machine Tool Co., Rockford, Ill.

Taft-Peirce surface grinder, immediately above, is compact in size yet has heavier sturdier proportions than usual. Wheel spindle swivels in a vertical plane about center of wheel. Taft-Peirce Mfg. Co., Woonsocket, R. I.

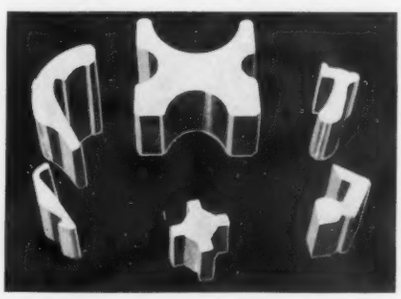
Jones & Lamson 16-inch Fay automatic lathe, top left, is a heavy duty machine for use with the latest cutting tools and will transmit over 50 horsepower. Eight spindle speeds with a standard set of change gears ranging from 28 to 150 revolutions per minute are provided. Jones & Lamson Machine Co., Springfield, Vt.

Bullard Cut Master vertical turret lathe, left, will machine surfaces 60 degrees from the vertical. Electric stops are provided for feeds of all heads in any direction. Sixteen feed and twenty speed changes are possible. Bullard Co., Bridgeport, Conn.

ELIMINATE
Tooling Up and Save
up to
ONE HALF
of your
MACHINING COSTS
with

MOLTRUP

Cold Drawn Sections



New uses are being discovered constantly for the better grades of cold drawn steel, in spite of the fact that it already has established its utility in the machinery and automotive parts field. The origination of the Moltrup sectional or adjustable cold-drawing die took a great bite out of machining costs; Moltrup cold drawn steel is drawn so accurately to size and shape it eliminates expensive machining; we think this is a matter quite worthy of your interest. Our confidence in our products is your guarantee.

MOLTRUP STEEL PRODUCTS CO.

BEAVER FALLS, PENNSYLVANIA

To the man who will visit the MACHINE TOOL SHOW

WARTIME BULLETIN

Wartime activity necessitates postponement of Machine Tool Show—makes facts on these pages of even greater importance to you.

At the Machine Tool Show in Cleveland, October 4th to 13th, you will have an opportunity to inspect the newest developments in machine tools. You will see many of these machines in operation, setting new high records of production efficiency. You will be face to face with new possibilities for cutting the cost of producing the parts you make.

If your visit leads to the purchase of new equipment, keep this established fact in mind: The steel you use on these new machine tools will determine to a large degree whether you realize their fullest potentialities for increased efficiency, cost reduction and product improvement.

If, on the other hand, you decide to continue to use your present machines, you will wish more than ever to probe the possibilities for speeding up production, reducing costs and improving the quality of their output. Even though they are running at full capacity and top speeds, you still may be able to gain profitable results by a change of steel or setup.

In either case, remember that Union Cold Drawn Steels are processed to bring greatest production efficiency, highest product quality and lowest parts costs to users of both old and new equipment. Union Drawn Field Service Men, drawing from the practical experience of many years of service to parts producers, are ready to cooperate with you in selecting the most efficient steel and in helping your men to establish the most profitable machining and fabricating practices. Union Drawn Steel Division of Republic Steel Corporation, Massillon, Ohio.

UNION COLD

When you are in Cleveland, don't fail to see the world's widest and fastest continuous strip mill in operation. Trips daily at 2 P. M. Call DIamond 2900 to register.

To the Man

WHO CANNOT ATTEND THE MACHINE TOOL SHOW

While you are unable to attend the Machine Tool Show at Cleveland, you undoubtedly are keenly interested in the new developments in machine tools to be shown there. You will read about them in the trade papers and see them illustrated in manufacturers' advertising and literature. You will become acquainted with the possibilities they offer for improving your product and your shop costs.

If, as a result, you decide to install some of this new equipment, keep in mind that while new machines are designed to operate more efficiently, the final result will be dependent to a large extent upon the steel you use.

If, on the other hand, you continue on with your present equipment, the problem of turning out fine quality parts at fullest machine capacity and minimum cost becomes an important consideration. Here, again, the steel you use is a vital factor in determining speeds, feeds, production efficiency and unit cost per piece.

For years, Union Drawn has specialized in providing machine tool users with cold finished steels that enable them to produce better steel parts faster and at lowest possible cost. Union Drawn Field Service Men — old hands at licking steel selection and fabricating problems — will be glad to cooperate with you in picking the right steel and developing your machining practice to get the most out of equipment of any type or age. Union Drawn Steel Division of Republic Steel Corporation, Massillon, Ohio.

DRAWN STEELS

BESSEMER STEELS
Freecut (S. A. E. 1112) • Supercut (S. A. E. X-1112)
OPEN HEARTH AND ELECTRIC FURNACE STEELS
All Carbon and Alloy Analyses

HUTHER SAWS

Segment with Firthite tips for Huther Bros. Patent Inserted Tooth Saw.

Huther Bros. Patent Inserted Tooth Milling Saw with inserts of best quality High Speed Steel, the ideal saw for cutting brass, copper, and aluminum, leaves cut perfectly smooth —a real production tool. Saw has side clearance, sharpen on top of tooth only. Let us tell you more about this saw.

FIRTHITE TIPPED SAWS

FIRTHITE-TUNGSTEN CARBIDE, made by Firth Sterling Steel Corp., is used for tipping this saw. For cutting non-ferrous metals, fibres, plastics, etc. Write for full information.

• • •

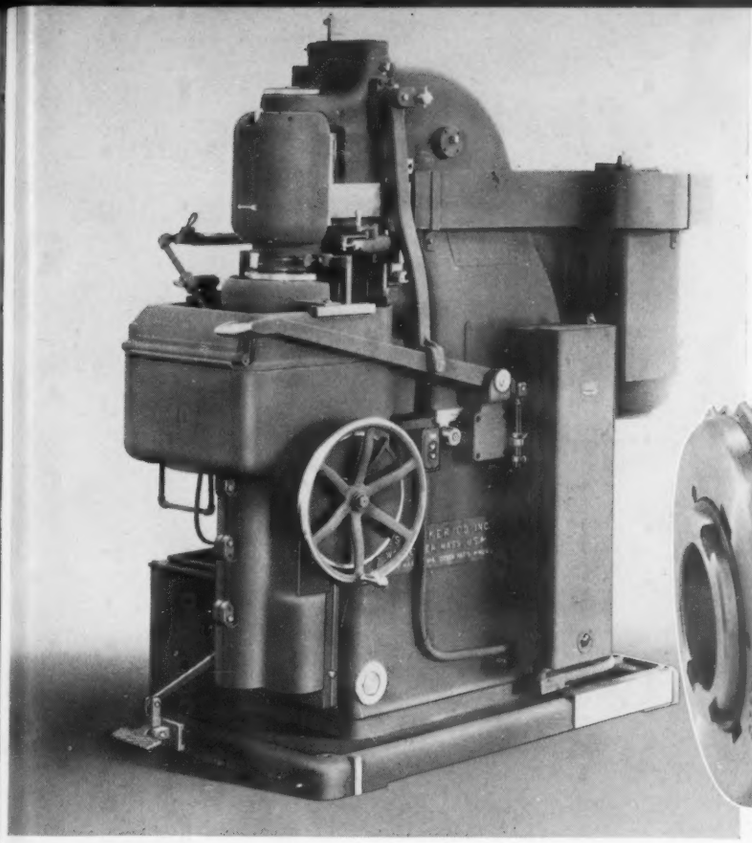
HUTHER SEMHI HARD EDGE
(TRADE MARK)
METAL CUTTING BAND SAW

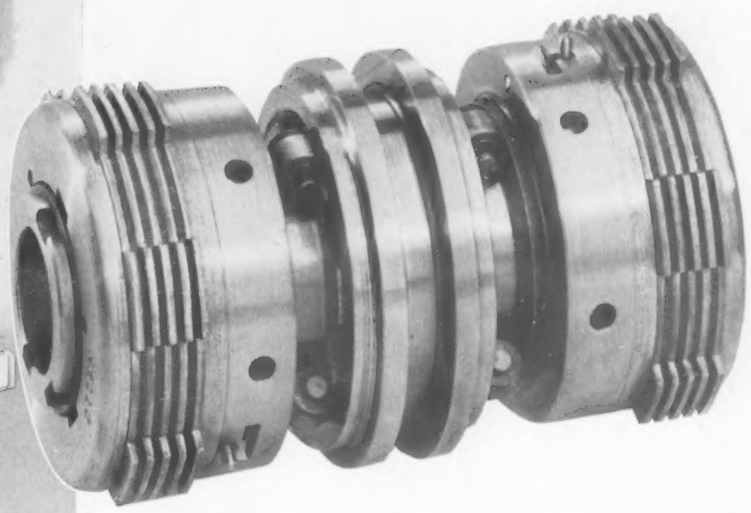
Write for prices . . . Advise material to be cut and speed

HUTHER BROS. SAW MFG. CO.

ROCHESTER, N. Y.

VERSATILE *New Machines*



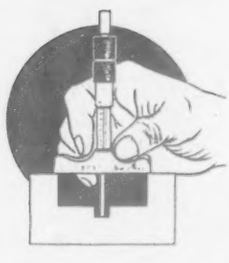


Twin Disc model MT clutch, above, because of its relatively high torque capacity, compactness and low operating pressure required is particularly well suited for machine tools. Clutch is available in both dry and oil types. Twin Disc Clutch Co., Racine, Wisc.

Van Norman No. 26 ram type universal milling machine, left, has 18 changes of speed from 30 to 1500 revolutions per minute in geometric progression. Ram type overarm is 43 inches long and has double taper bearing. Van Norman Machine Tool Co., Springfield, Mass.

Walker single stroke surface grinder, left above, with starting and stopping of table and magnetizing of clutch automatically controlled by raising or lowering wheel head. Table has six speeds. Foot brake facilitates stopping table. O. S. Walker Co. Inc., Worcester, Mass.

Warney & Swasey standard preselector with automatic program device, below, makes it possible to select in advance a sequence of as many as eight spindle speeds and have that cycle repeated automatically. Device can be locked after setting up. Available with No. 4, 5, 1-A, and 2-A turret lathes. Warner & Swasey Co., 5701 Carnegie avenue, Cleveland



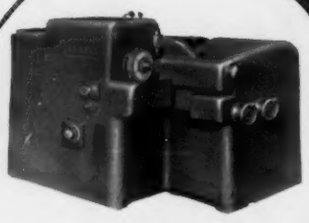
WHEN THE CURTAIN RISES on the greatest show in Machine-Tool history in Cleveland, October 4, The Landis Tool Company will make its bow with a premiere cast of four completely new grinding machines never before shown and absolutely unique in design and productive capacity. They will be ably supported by seven other Landis Grinders, changed and perfected by trained Landis engineers. ★ Headlining the cast will be the new streamlined Landis 4" x 12" Type H Plain Hydraulic Grinder, a small, compact, highly productive machine that will set the pace for future grinding machine design. The surprise machine of the performance will be the new 6" x 40" Type IW Hydraulic Grinder. This machine automatically loads and unloads the work, is equipped with three large grinding wheels, and yields a tremendous output. ★ Two other entirely new machines, the Landis 18" Radial Cam Grinder with its high degree of accuracy, and the Landis No. 1 Race-a-Way Grinder featuring a high speed spindle operating at 50,000 R.P.M., will make their debut. These, along with seven other grinders, complete a performance stressing precision and finish.

Frankly this ad was prepared before the Machine Tool Show in Cleveland was postponed. Left as it stands, however, it will serve as an excellent means of introducing our new and perfected machines to you.

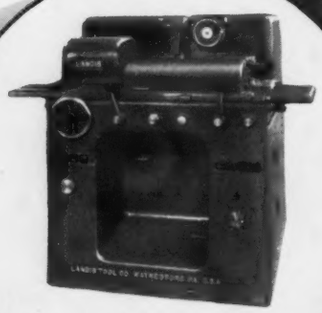
LANDIS

AT THE SHOW

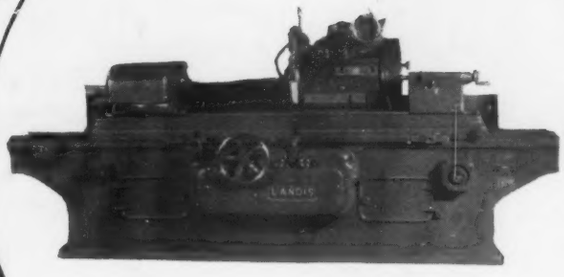
•PRECISION LANDIS GRINDERS•



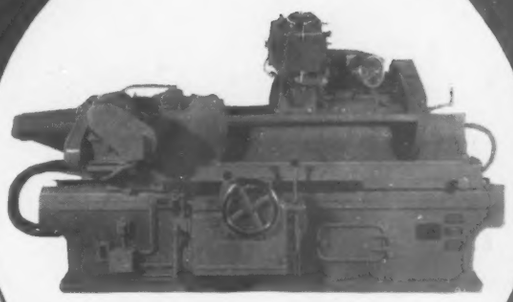
★ 18" Radial Cam Grinder



★ 4" x 12" Type H Plain Hydraulic Grinder

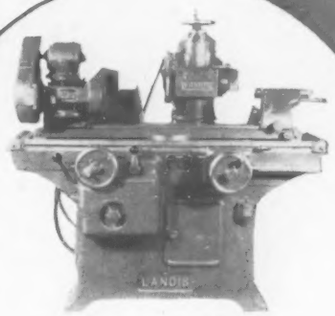


★ 14" x 36" Type C Hydraulic Universal Grinder

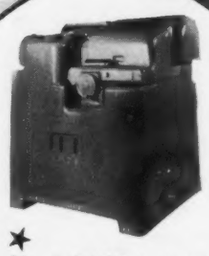


★ 5" x 40" Type D Hydraulic Cam Grinder

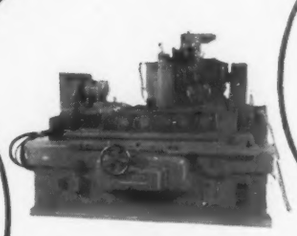
An all Star cast
to be seen at booth 5302
presented by
LANDIS TOOL CO.
WAYNESBORO, PENNA.



★ 12" x 28" Universal and Tool Grinder



★ No. 2 RACE-A-WAY

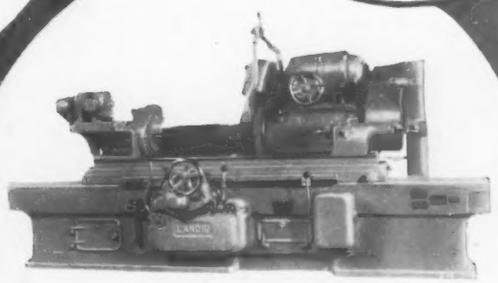


★ 10" x 36" Type C Camshaft Main Bearing Grinder

★ No. 1 RACE-A-WAY

★ No. 2 RACE-A-WAY

★ 16" x 40" Type IW Hydraulic Grinder



★ 10" x 48" Type D Plain Hydraulic Grinder

308

What

By

CLIFFORD S. STILWELL
Executive Vice President
Warner & Swasey Co.
Cleveland

■FOR many years machine tool replacement has not kept pace with obsolescence. Thus, over and above the needs of normal industrial growth, there likewise has accumulated a serious need for new machine tools to overcome this obsolescence. I am not concerned about the prospective volume of machine tool business, and when I say this I am not thinking of any current abnormal demands but the good solid business which is destined to come out of normal replacement and expansion right here in our own United States. What concerns me is the basis upon which this large normal volume of new machine tools will be bought.

I have been selling machine tools for over twenty years. During all of that time I have never been entirely satisfied as to the way in which many machine tools were sold, nor have I been satisfied as to the way in which many machine tools were bought.

The machine tool builder naturally is proud of the improvements in the mechanical performance of his product. Better gears, better bearings, more power, greater rigidity, higher speeds, more convenient controls, neater physical appearance—all these instinctively offer themselves as talking points in his sales presentations. But these things in and of themselves really are of no consequence to the buyer. They are of significance to the buyer only insofar as they spell reduced operating costs, increased productivity and greater return on his investment dollar.

For many years I have been trying to impress upon our industry the fact that whereas machine tool builders sell machine tools, the customers buy operating profits.

The customer wants to know, "How much money can I save, how much more profit can I make, by the use of this new machine tool?" And yet all too often the machine tool salesman continues to present his case to the customer merely in terms of "better gears, better bearings, greater rigidity, higher speeds, better cutting tools, etc."

Within recent years—I am glad to say—very considerable progress has been made within the machine tool industry in presenting the case for the new machine tool, not in terms of mechanical improvements but in terms of profit possibilities which those improvements represent. Machine tool salesmen who have acquired this technique can very well be termed "profit engineers." It is my hope that before long all the salesmen in our industry will definitely come within this classification.

And let me say most emphatically that one of the reasons why it has been rather difficult to persuade machine tool salesmen to become "profit engineers," rather than exponents of mechanical improvements,

of the Future?

has been the fact that the average buyer of machine tools likewise has been all too prone to think in terms of "mechanics" instead of in terms of the "arithmetic of profits."

It literally has been all too easy to sell machine tools upon the basis of their excellence as pieces of machinery instead of upon their profit possibilities. Certainly this first is not a sound basis for sales.

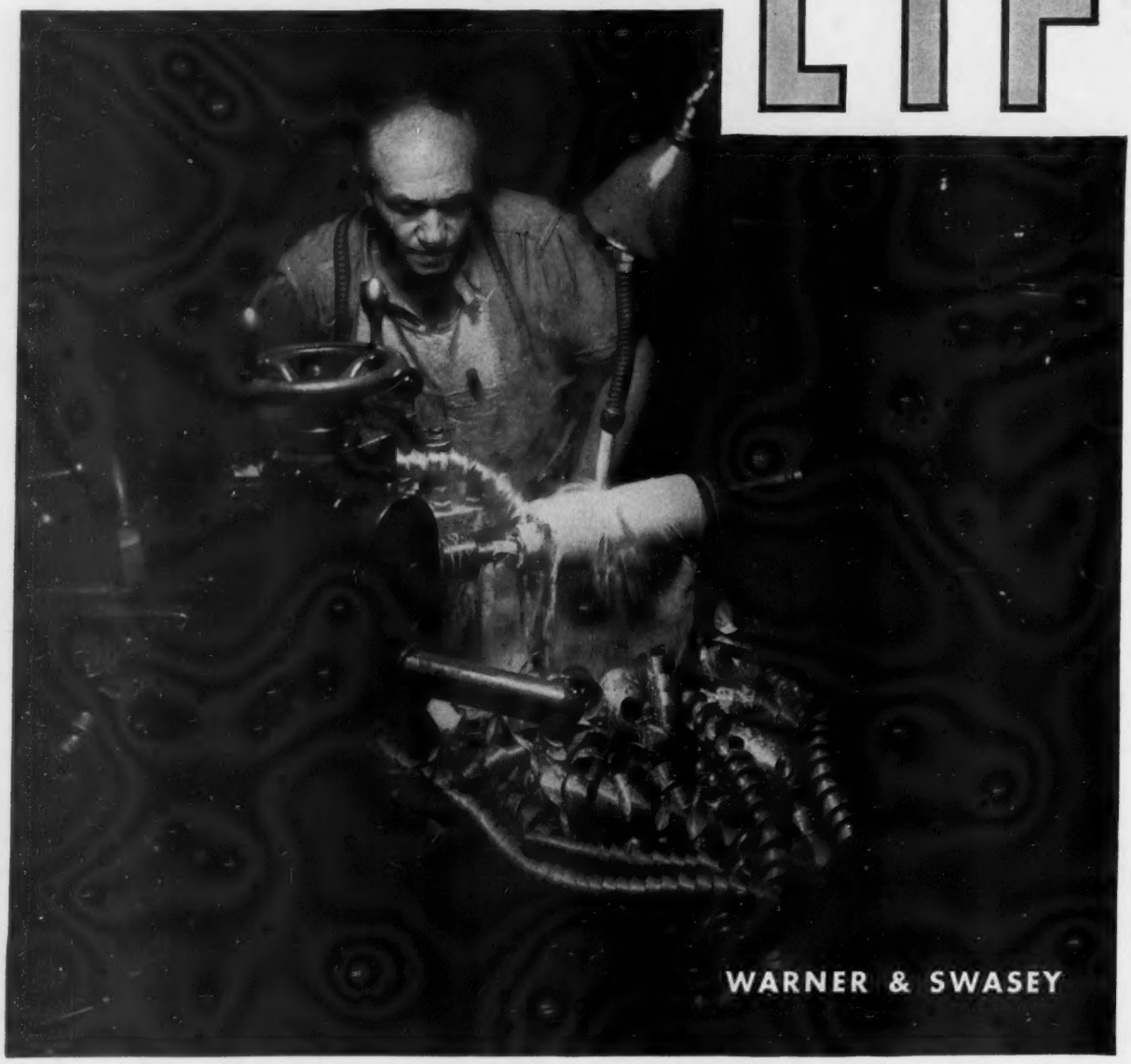
For instance, it might be entirely possible to manufacture a machine tool "so good that it would be good for nothing." It might be possible to make such a machine tool with rigidity beyond anything heretofore attempted, with cutting speeds surpassing all previous records and with an accuracy of performance far exceeding all past experience. But the cost of building this machine capable of performance so far beyond all practical needs would be so great that no manufacturer could afford to buy it. As a machine, it literally would be "perfection"—but it would not create additional profits.

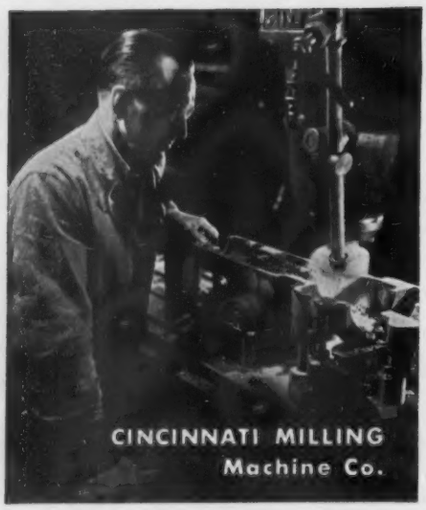
It is part of the sales bible of our company—and I believe of our industry to a large degree—that the economic justification of machine tool sales must rest on reduced operating costs, greater productivity per operating dollar, greater accuracy to meet competitive conditions or consumer requirements—factors representing improvement in product, savings in costs, or both.

Suppose that through an advertisement, an editorial description, demonstration, sales presentation or otherwise, you have become interested in a certain modern machine tool. Would this new machine be of benefit to you? What can this machine tool do on the job which happens to be your particular problem?

Before even the most proficient machine tool

AS ALWAYS LIFE





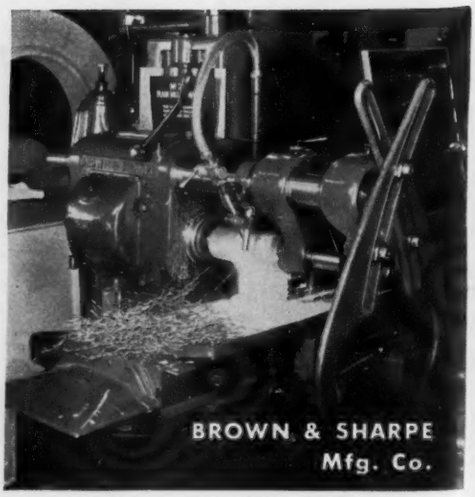
PERFORMANCE PROVES SUNOCO'S VALUE as an aid in establishing new and higher standards of machine tool efficiency. On performance and performance alone SUNOCO has won recognition wherever machine tools are operated.

☆

CUTTERS HOLD THEIR EDGES LONGER with SUNOCO and mill more pieces per cutter grind — which means lower cost per piece machined.

☆

MILLING CUTTERS WILL NOT BURN, chips will not seize and cuts will be clean and even when SUNOCO is used. SUNOCO increases the life of your milling cutters.



OF THE MASTER TOOLS OF INDUSTRY ARE PROTECTED WITH

SUNOCO
EMULSIFYING CUTTING OIL

Naturally machine tool operators, in their own plants, want their machines to operate at top rated capacity. That's why the outstanding leaders of the machine tool industry have chosen SUNOCO Emulsifying Cutting Oil.

As always, these same leaders are using SUNOCO. They know its high lubricating and heat absorbing qualities make possible increased production . . . more pieces per tool grind . . . and better finishes with less time out for replacing and resetting tools. They know wherever "perfect" production is essential . . . use SUNOCO.

Look through this issue. See the huge strides made by machine tool builders . . . SUNOCO aids metaldom's most modern machines to maintain peak production at all times . . . Call in a SUN Cutting Oil Engineer today and learn how SUNOCO Emulsifying Cutting Oil will aid production in your own plant.

SUN OIL COMPANY, PHILADELPHIA

FAST CHATTERFREE, CLEAN ACTION is assured at the point of the tool when SUNOCO is used. SUNOCO assures heavy cuts at high speeds with long productive runs between tool grinds.

INCREASED TOOL LIFE, CLEAN CUTS, decreased rejects, savings in power and high efficiency in machine tool output may be established with the use of SUNOCO flooded over work and tools.

FASTER STOCK REMOVAL without increasing wheel wear and minimum danger of burning the work is possible with SUNOCO.

☆

NTH DEGREE ACCURACY, surface perfection and high finish are readily possible with SUNOCO.

"profit engineer" can answer that question he must know the exact nature of the "work" which you have in prospect. He must know *all* about this work. Without these facts it is impossible to estimate profit potentialities of a machine tool.

The kind of work to be done makes all the difference in the world. I'm not talking now about broad divisions of work which fall into natural classifications such as grinding, boring, milling, planing and turning. I am talking about the specific nature of your work within any one of these classifications.

First of all, does you work fall entirely into one rather narrow type or does it possess considerable variety? Isn't it possible that the particular type of work being done today might be superseded by some different type of work tomorrow? This raises the question of adaptability. For work of an almost identical nature over a long period of time, one type of machine may be particularly suitable—whereas if a reasonable variety of work is to be expected, it might be far wiser to select a machine tool of a far higher degree of adaptability.

Now supposing that most of the work to be done is of a very similar type, what is the expected volume of identical work? This question has vital bearing upon the relationship between setup time and actual operating time. For instance, a new machine representing a substantial investment but capable of a very high rate of operation, might be justified on a type of work which requires setup alterations only once or twice a day, but it may not be wholly justified on the type of work which comes through in small quantities, to varying specifications—therefore requiring setup changes every few minutes.

What are the expected hours of operation of your machine tool equipment? A new machine tool with increased productivity and costing considerably more than the old machine which it replaces, might show only comparatively small net savings if operated on the basis of one shift, three to four days a week. This same machine, however, would show surprising savings and greatly increased potential profits if operated on the basis of two shifts per day, six days a week. In short, to take full advantage of the increased productivity per operating dollar offered by the new machine tool, a reasonable volume of production must be in the offing.

From the standpoint of quality on the other hand, quite a different picture presents itself. Today accuracy has come to the fore to a degree far beyond the accepted standards of the past. Allowable limits of tolerance rapidly are growing narrower. This is becoming just as true in the consumers' goods field as it is in the producers' goods field. The outstanding example is in the aviation industry.

When it comes to accuracy, the question of costs really is secondary to the question of *survival.* Any company which cannot meet modern requirements as to accuracy simply loses the business. The problem, then, simmers down to that of determining what machine tool—capable of assuring the required accuracy—will do the required work at lowest cost.

Lay All the Facts on the Table

In view of all these considerations, I urge most emphatically that manufacturers, when negotiating for the purchase of new equipment, should present the "profit engineers" of the machine tool industry with detailed information as to the exact nature and volume of work whcih they are anticipating.

As I have said before, volume of sales today does not represent a problem to the machine tool industry. The enormous extent of obsolescence which has accumulated in the industrial plants of the United States is sufficient to insure a volume of machine tool orders which will keep the plants of our industry busy for several years regardless of any temporary abnormal business which may result from the highly regrettable state of affairs abroad. We are concerned with the "long pull" problem of insuring that the machine tools which we sell actually will represent maximum usefulness over their full normal life span.

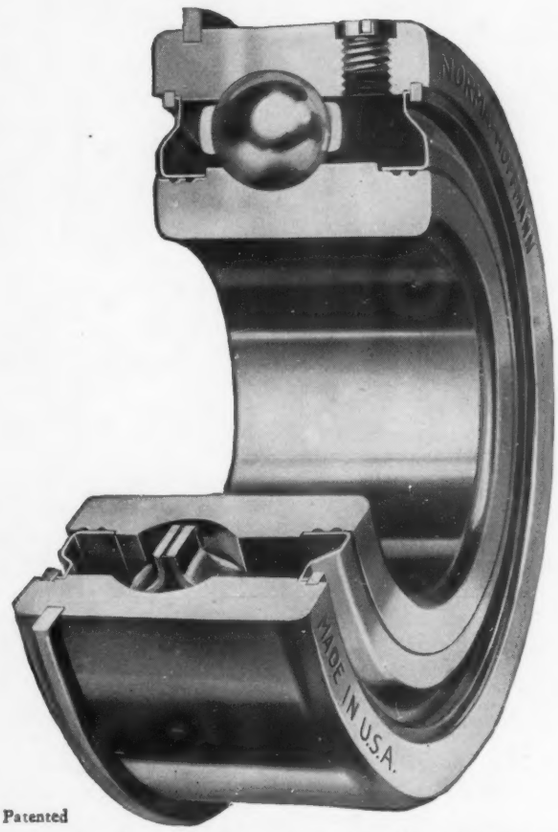
In other words, we want machine tool buying and machine tool selling to take place, to the largest possible extent, upon the basis of sound "profit engineering." In order to achieve this result we must have the full co-operation of the buyer. We must know definitely and concretely just what work he expects machine tools to do in his plant. Then, in turn, we can supply him with exactly those tools which will perform this work in the way which will lead most substantially toward larger potential profits—not just under "boom time" conditions but under the normal conditions which certainly will prevail again during the useful life of these tools.

CARTRIDGE

SIMPLIFY AND SAVE

With This

IDEAL SELF-SEALED BEARING



Patented

MADE TO STANDARD DOUBLE-ROW WIDTHS WITH 100% GREATER GREASE CAPACITY

Available in Four Different Series

"3600" . . . . . with standard outer ring.
"43600" . . . . . with shoulder ring in outer ring.
"3600-J" . . . . . with refilling plug in outer ring.
"43600-J" . . . . . with shoulder ring and refilling plug in outer ring.

TO "Simplify and Save" is the avowed aim of every progressive motor and machine designer. It is the economic doctrine preached by good management. It is made obligatory by competition.

In ball bearings, this aim is achieved in a highly practical way by the use of NORMA-HOFFMANN "CARTRIDGE" Self-Sealed Ball Bearing, as illustrated here.

A revolutionary departure from orthodox design, the "CARTRIDGE" Self-Sealed Ball Bearing provides inherent features which, until now, could be incorporated in motors or machines only by elaborate, complex and costly external means.

No longer is it necessary for designers to choose a simple unprotected ball bearing, and then build an involved seal and mounting to insure satisfactory operation —since all requisite characteristics are embodied in the "CARTRIDGE" Ball Bearing—a self-contained, grease-packed and practically fool-proof unit.

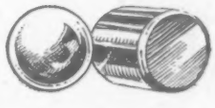
Thoroughly tested for several years in our laboratory and in the field under continuous duty, this bearing has demonstrated not alone its value and efficiency but ITS SUPERIORITY. Already a number of representative manufacturers of motors and other units have adopted it. It bids fair to be the bearing of the future, representing a real forward step in simplifying design and in insuring improved efficiency, long, uninterrupted performance and absolute cleanliness.

"NORMA-HOFFMANN"

Ask for Catalog F-951-C, *containing full details and typical "Cartridge" mountings.*

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

BEARING



the Shop makes the Sale —

Dear Jack:

So you think you're a salesman! Listen, that long-run order wasn't sold by your salesmanship. It was sold right here - IN THE SHOP.

That three cents a piece saving is what did the trick and you don't even know how we did it. The old man didn't want to buy any new equipment, but when I showed him the Colonial cost figures on running the parts off on their 'Dual Ram' Broaching Machines, he actually broke down and fished out a cigar.

What's more, he's given me a go-ahead on re-tooling the odd-lot line. Wait and see what happens to your rejections now.

We're going to start every part off by broaching either the I.D. or the flats. That's where most of our trouble has been - not getting uniform accuracy off the first operation.

I'm going to the Cleveland Show to look over the Colonial line. With all their standard broaching machines, they ought to have just the job for us. If you're down that way - on your so-called 'sales' calls - I figure you owe me anyway, a couple of drinks.

And keep out of my hair after this.

Yours for real salesmanship,

Bill

— *by* Broaching

COLONIAL BROACH COMPANY

147 JOS. CAMPAU
DETROIT, MICHIGAN

Slushing Oils

(*Concluded from Page* 66)

amount, excessive corrosion resulted.

Slushing oils containing chlorinated materials will introduce an objection which must always be carefully considered.

Type No. 10. A green deposit on copper coated steel resulted from using a drawing compound which contained fatty oil and a sulphurized material. Straight mineral oils appear to be best drawing compounds as they do not form the green deposits over a long period of contact with the metal.

Type No. 11. Rust marks on steel articles after processing are often caused by water from soluble oil emulsions used in grinding or cutting operations. The water emulsion, if not completely removed before application of slushing oil, quickly forms rust. This can be eliminated by removing moisture completely through dipping in hot slushing oil, by using a light-bodied straight mineral oil instead of soluble oil emulsions for grinding or cutting, or by using a "rich" soluble oil emulsion sufficient to protect steel from corrosion.

Important in choosing a slushing oil is whether or not it can be easily removed when the steel is to be lacquered or enameled in a subsequent operation. Usual methods of removal include: Wiping the oil off steel parts by hand with cloth soaked in kerosene. Immersing steel in a hot alkaline solution, or putting it through "washing machines" which use these solutions. Removal of oil by organic solvents, such as tri-chlor-ethylene.

Study shows all types of slushing oils are removed sufficiently for most subsequent treatments by rubbing with a cloth soaked in kerosene. Alkaline solutions remove all these oils, although the grease types come off with a little more difficulty than the others.

An organic solvent such as trichlor-ethylene removes straight mineral and fatty types with ease. However, grease types and those containing water soluble soap are removed with more difficulty, since they are not completely soluble in this agent.

Cleans Metals

■ A new agent, Electrex, has been developed by Magnus Chemical Co., Garwood, N. J., for cleaning metal surfaces for electroplating or other finishing. Being acid and hard-waterproof, it is claimed to form no troublesome scum by drag-over and to have rapid wetting, penetrating and dispersive effects for thorough cleaning. Because of low surface tension, solutions made with this agent are free rinsing, which keeps succeeding rinses and dips free of contamination. With reverse current and high current density, agent is used at high concentration.

Steel or copper surfaces can be completely cleaned of polishing or buffing compound, smut, finger marks and shop dirt in the one anodic electro-cleaning operation. Degreasing, precleaning, scrubbing or hand wiping are thus rendered unnecessary. Operated close to the boiling point and with a current density of 40 amperes per square foot, cleaning time using this solution varies from ½ to 3 minutes, depending upon amount and kind of soiling present. Where the work is very heavily loaded with drawing, polishing or buffing compound, the usual good practice of two-tank cleaning is recommended as an economy.

Pattern Design Manual Covers Wide Field

■ *Pattern Design*, by B. Rupert Hall, associate in mechanical engineering, University of Illinois, and Henry E. Kiley, instructor in mechanical engineering, Massachusetts Institute of Technology; cloth, 193 pages, 5 x 8 inches; published by International Text Book Co.; supplied by STEEL, Cleveland, for $2.50.

As an intermediary between the designer and the foundryman the patternmaker must be able to interpret mechanical drawings, to visualize an object in three dimensions and finally to produce a full-size counterpart of the object in wood, metal or plaster. He must be acquainted with the molder's craft since patternmaking is more closely allide with molding than with any other branch of machine manufacture. The patternmaker should know how to incorporate constructional features in his product to facilitate work in the foundry.

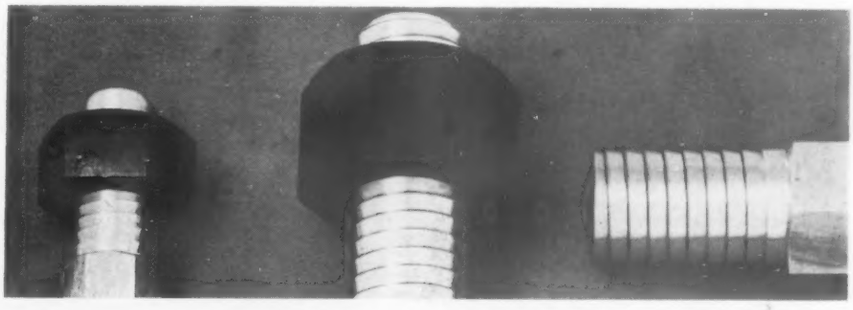
The present volume meets these requirements competently. An early chapter on green sand molding acquaints the student with the way in which patterns are used. A progressive series of 27 problems is included to meet requirements of the engineering student. They involve construction and interpretation of mechanical drawings and should help to develop ability in handling general design problems.

The text is further supplemented by over 200 line and halftone illustrations, a glossary of technical terms peculiar to the industry and an index. Text is presented under the following chapter headings: Pattern details, molding details, metals used in pattern construction, construction work and joints, design for low cost production, pattern department management, special designs, explanation of work required in planning pattern equipment, problems in pattern design.

Flexible Wrinkle Finish

■ A wrinkle finish for coating flexible materials such as fabrics, paper and leather has been developed by New Wrinkle, Inc., Dayton, O. It can be sprayed, knifed or rolled on the material to be finished and dries into a uniform texture—small to coarse, as desired. It is a one-coat finish and looks best when spread thin; it does not chip or peel. Wrinkle finish is being made available to fabric, paper and leather convertors under licensed agreement with the manufacturer.

Nonreversible Shallow Thread Tightens Under Stress



■ **Known as the Pickop-Branford thread, this new shallow nonreversible thread produced by New Haven Vibrator Co. Inc., New Haven, Conn., cuts away a minimum of stock and is claimed to have less than a 10 per cent weakening effect on joint. Since taper on threads tends to tighten nut under stress, this thread is particularly effective in the bolting down of equipment and on high-frequency vibrating machinery. When applied to tubing there is no perceptible distortion of the inside diameter as the direction of stress is longitudinal. Portion of thread that appears flat actually has a slight curvature on it for line contact between nut and bolt to aid locking. Thread has been issued patent No. 2,036,604**

Arch-Rib Roofs

Use of special fabricated beams made up of sections joined by welding forms arch-rib roof. Excellent structure is produced and no supporting columns are necessary. Proves economical in material and erection costs

■ IN THE selection of the arch-rib type of roof construction to house its new ice rink located off Soldiers' Field road in Allston, Mass., near Harvard stadium, the Skating Club of Boston recognized the advantages offered by arch-rib construction in enclosing a large, unobstructed floor area.

The principle of carrying imposed loads to foundations by means of arches has long been known for its economy. In addition, the outline of the arch is particularly suitable for efficient lighting, heating and ventilation. The unobstructed clearance to the roof, rising to a maximum over the center of the rink, lends a feeling of space and freedom which no other outline provides.

Exclusive of the service and locker room bay which abuts one side of the building, the structure covers an area of 110 x 207 feet and houses a skating rink measuring 85 x 193 feet. The side walls, constructed about 16 feet high, are of masonry. The roof deck is 2-inch plank on steel purlins, or supports. The two lower lines of purlins are raised above the ribs to produce a straight slope down to the eaves for appearance and drainage.

The arches are two-hinged as foundation conditions did not warrant the use of fixed-end arches, and one of the features of this design is the economical and simple type of hinges used here.

Pipe Gallery Distributes Loads

In the design of the foundations, which not only carry the weight of the building but also the horizontal thrust from the arches, an ingenious use of a pipe gallery (required for the freezing system) was employed to distribute the forces uniformly to the soil. Thus, the necessity of much larger individual footing or tie rods from side to side was eliminated.

Since the facilities of the clubhouse are limited to the membership, it was not necessary to provide space for large audiences. The arches begin at the floor line not far from the edge of the ice, rising rapidly at first on a radius of 41 feet 9 inches and continuing on that curvature for a little more than one-fourth of the total length of the arch to a point of tangency with the 66-foot radius curve that forms the crown section.

Fig. 1—Maximum dimensions of Edgebends are:

Web	A	d	c
½"	20'	48"	24"
½"	40'	24"	36"
¾"	30'	24"	24"

The arches, eleven in all, are spaced on centers 20 feet 6 inches apart. The distance between end supports for each arch is 106 feet. The distance for each arch is 106 feet. The distance from spring line to the center line of rib at the crown is 44 feet 8 inches.

Each rib is composed of curved web plates, or Lukens Edgebends, 24 inches high and ⅜-inch thick, bent at Lukens to the desired radius, and four 6 x 3½-inch angles of varying thickness to suit the varying stress requirements. The angles were riveted to the Edgebends. The ribs were shop fabricated in three sections, thus requiring two field splices. Each section contained two

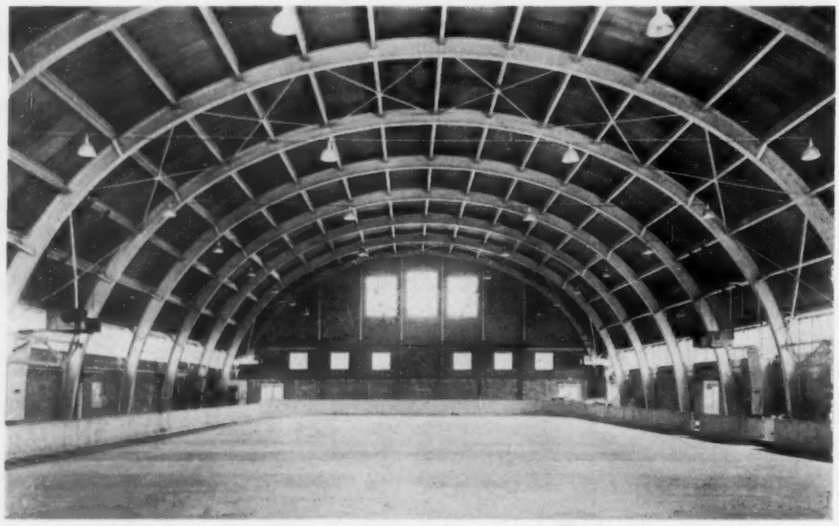
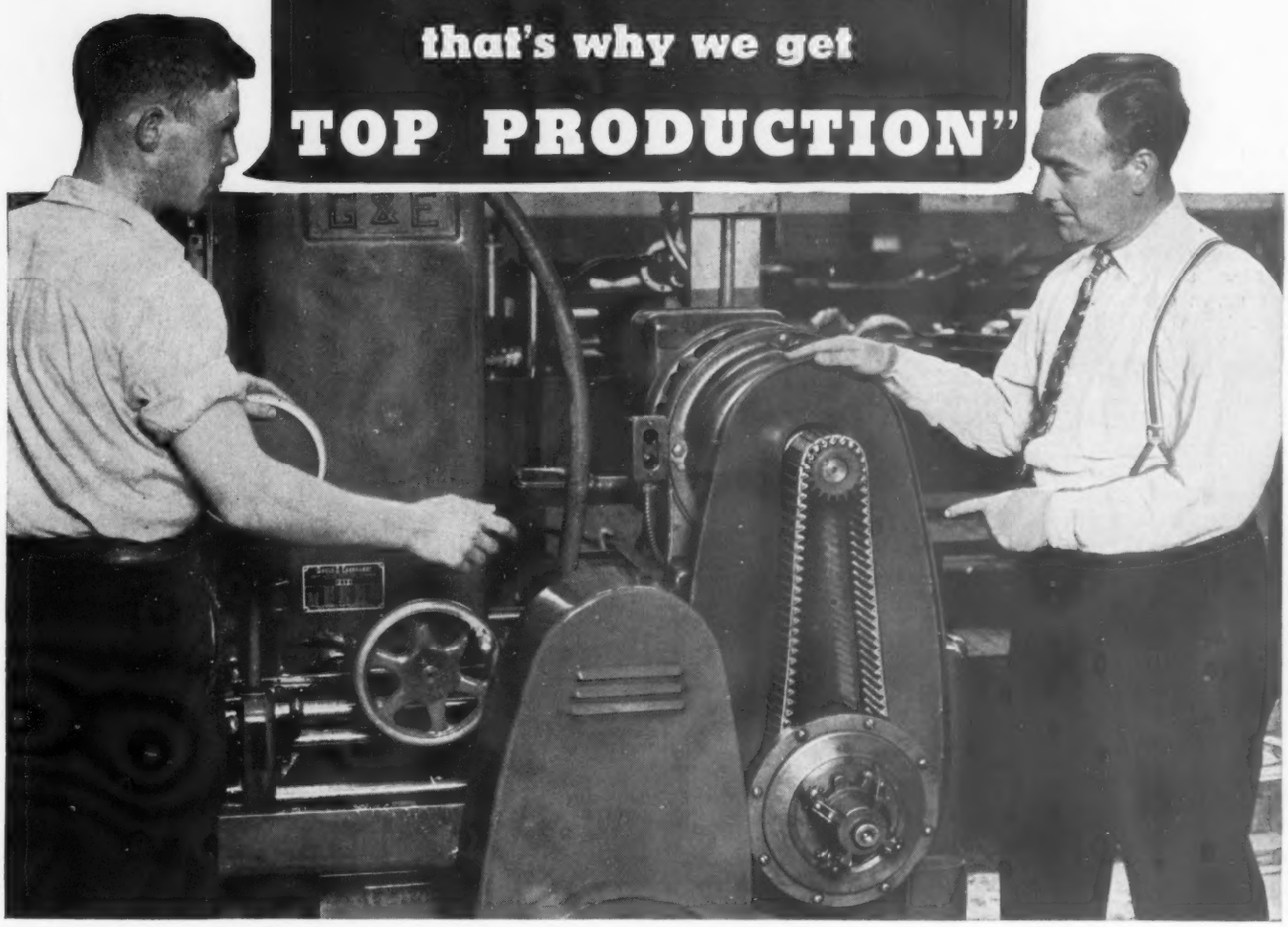


Fig. 2—Backbones of these arches forming so-called arch-rib roof are Lukens Edgebends of welded steel plate

Abstracted from *Lukens Life*, published by Lukens Steel Co., Coatesville, Pa.

"IT'S POSITIVE-- that's why we get TOP PRODUCTION"



Link-Belt Silverstreak silent chain drive as used on Gould and Eberhardt gear cutting machine.

● Machine tools are always major investments. Why then, with so costly and important units, stop short of anything but the best driving medium?

The efficiency of a machine tool depends largely upon the drive. The number of good pieces produced in a given time is a measure of the efficiency of the machine.

Link-Belt Silverstreak silent chain is "Flexible as a Belt—Positive as a Gear—More Efficient Than Either." It is truly "the productive drive for machine tools," because—

It enables the tool to cut away the metal without tearing or chattering.

It increases the life of the cutting tool.

It keeps the machine up to its rated capacity —no lost R.P.M.

It has maintained its high efficiency for 10, 15, 20 years of service and longer.

It is conveniently applied. The motor can be located almost anywhere.

It operates equally well on short or long centers, and is equally efficient and economical on first reduction and intermediary drives.

The simple removal of a pin at any joint permits lifting away of the entire chain. It is not necessary to dismantle the whole drive as when replacing endless belts.

There is no other driving medium which accomplishes these results at so low a cost as Link-Belt Silverstreak silent chain.

It requires little attention—no upkeep expense.

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LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

lengths of Edgebends, shop spliced at the center, the shorter lengths of plates being more convenient for handling in the curved condition.

Cross bracing was installed in the middle and two end bays, beginning with a portal system at the floor line, to give the maximum unobstructed use of the floor even at the wall line and continuing the whole length of the arch.

Although the 6-inch leg of the flange angles on the ribs is outstanding, making each section of the arch rigid enough for handling on its weaker axis, when assembled together, the whole arch was naturally flexible about the weaker axis.

Falsework Eliminated

Saving of time and expense was realized in erection of the ribs by elimination of the usual falsework. Sections were assembled and riveted on the ground, and the ribs lifted and rotated 90 degrees into a vertical plane, in which position it was a simple matter to lower them over the anchor bolts. However, to raise such a flexible member out of the horizontal plane, it was necessary to determine three points of suspension (one at the mid-span and two near the one-third points), so located that the deflection between these supports would be a minimum. Between the two lower points, a 70-foot derrick boom was temporarily installed to resist the horizontal force in the lifting bridle and to reinforce the arch against "jackknifing" during erection.

Fabrication of the steelwork at the plant of New England Structural Co., Everett, Mass., progressed concurrently with the construction of foundations and installation of the freezing system at the rink. On Nov. 19, 1938, the first arch was raised. Nine working days later, the last steel was set. During this interim, the roof deck was installed on more than half of the frame which had already been plumbed, painted and bolted, and work continued on the floor below, uninterrupted by the usual falsework. On New Year's eve, the clubhouse was open for use.

Since the erection of this structure, Lukenweld, Inc., division of Lukens, has developed a welded arch-rib for use by structural fabricators, which eliminates riveting of angles to the web plates, and provides wider latitude in beam design, with increased strength and less weight. These welded members can be obtained in any commercially usable radii, gage of web and flange dimension. Recommended types of field splices will be furnished in event the arch must be shipped in two or more pieces.

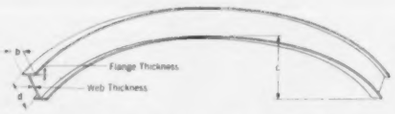
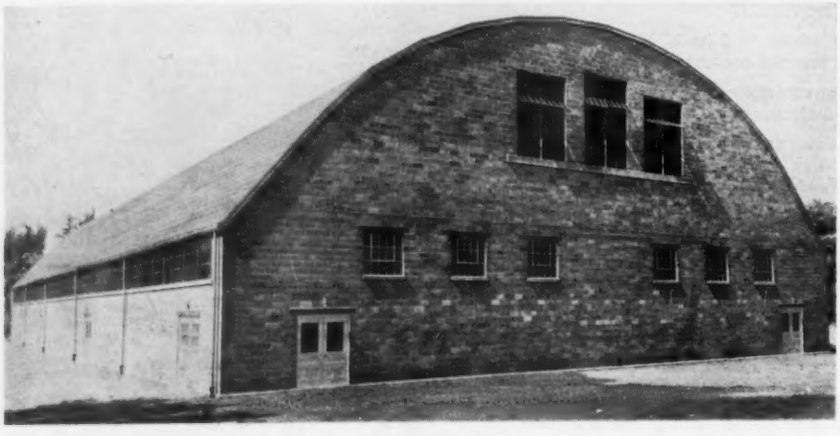


Fig. 4—Welded Edgebend member for arch-rib roof construction as fabricated by Lukenweld Inc., Coatesville, Pa.

Fig. 3—Exterior of new rink of Skating club of Boston, located off Soldier's Field road in Allston, Mass.



Manual of Arc Welding By General Electric

■ *Arc Welding Manual*, paper, 204 pages, 5½ x 7 inches; published by General Electric Co., Schenectady, N. Y.; supplied by STEEL, Cleveland, for $1.

A spiral-bound pocket-size volume for the beginner and the experienced welder, containing information derived from experience of a leading builder of welding equipment. The first chapter is devoted to general information on arc welding. Then follow chapters on the technique and practical applications of this form of welding, discussion of automatic and atomic hydrogen arc welding.

A training course for operators occupies 48 pages, illustrated to show position of electrode, its movement and deposition of weld metal. This contains 15 lessons in formation of the various types of welds required in regular work.

Types of equipment are described, with instructions for choosing that best suited to various purposes, with illustrations of various accessories. An appendix contains several engineering tables and a handy estimator for determining arc welding electrode quantities.

•

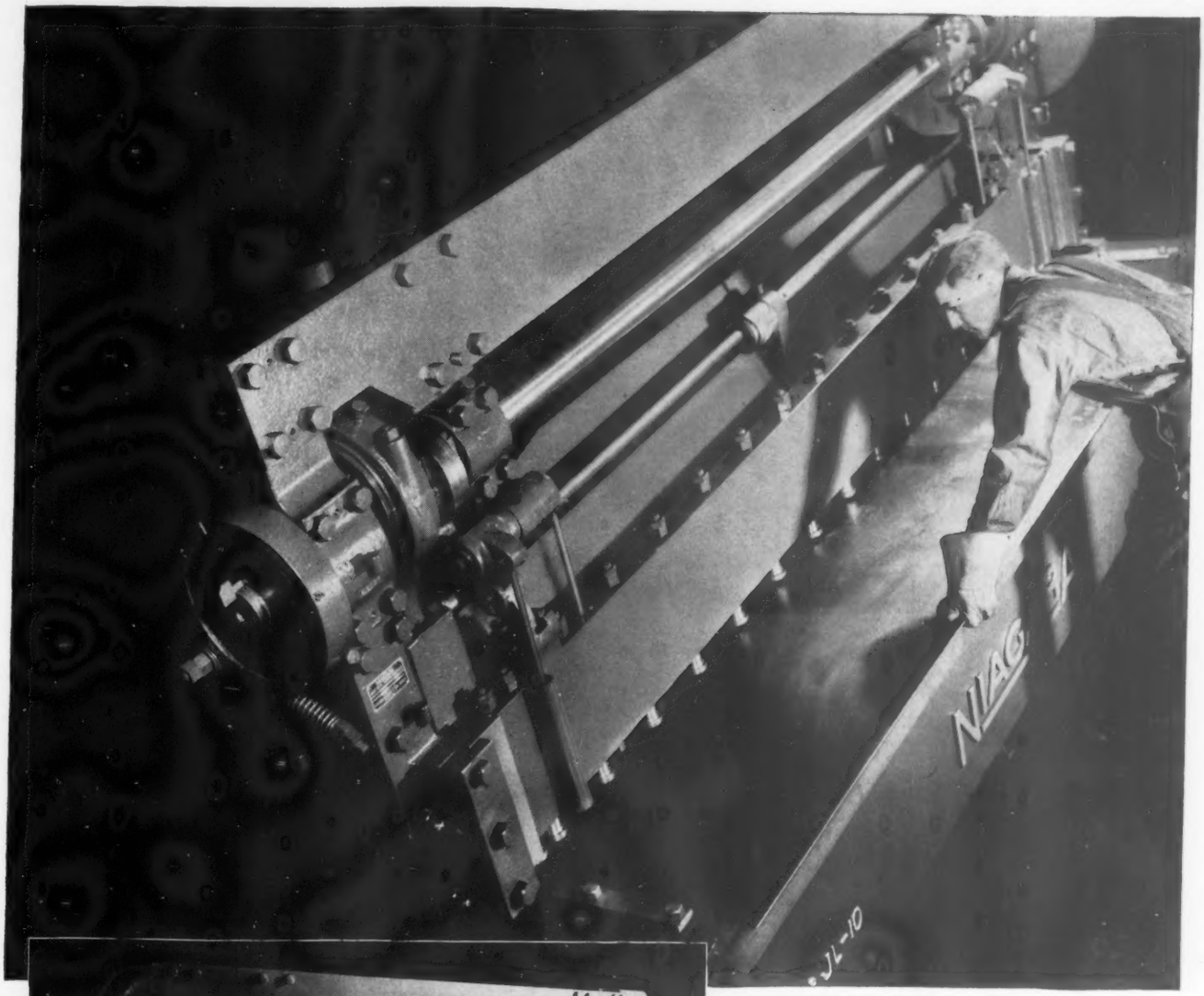
New Chemical Porcelain

■ A chemical porcelain known as "Lapp Ware," has been put on the market by Laboratory Furniture Co. Inc., 37-18 North Boulevard, Long Island City, N. Y. Extremely dense, completely vitrified, entirely nonporous and free from voids, blebs and minute pore spaces, the porcelain is also exceptionally tough and difficult to break. This characteristic, together with a relatively low thermal co-efficient. makes it highly resistant to thermal shock. Fired at temperatures above 2250 degrees Fahr., the porcelain is chemically inert to all acids and alkalies except hydrofluoric acid. The glaze is hard, translucent, glass-smooth and will not craze, crack or discolor. It will not oxidize powder or discolor hands or clothing. White is the standard color but chocolate brown, mahogany and other colors also are available.

Measuring No-Load Speed of Small Motors

■ Determination of the no-load speed of low powered motors is complicated by the fact that conventional tachometers absorb an appreciable portion of the power available and hence indicate the speed under a loaded condition rather than at no load as desired. Recently Clough-Brengle Co., 2815 West Nineteenth street, Chicago, assisted a manufacturer in the solution of this problem by a method which is both simple and effective for production testing and at the same time highly accurate.

The product to be tested was the motor of a small hand grinder rated at about 0.02-horsepower running at 15,000 to 18,000 revolutions per minute at no load. A small alternating-current generator was coupled to the motor and connected to the vertical deflecting plates of a cathode-ray oscillograph. To the horizontal deflecting circuit of the oscillograph was connected a calibrated beat-frequency oscillator. The oscillator then was adjusted until the frequency of the oscillator was the



Niagara Power Squaring Shears are built with capacities up to ¾ inch and all cutting lengths. Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. Branches: Cleveland, Detroit, New York.

THESE photographs show the latest type Niagara High Production Power Squaring Shears being used for squaring and slitting steel sheets in America's foremost industries including aviation, automotive, electrical equipment plants, steel warehouses, steel mills, railroad shops and other plants. More working strokes per hour are the result of convenient arrangement for handling sheets . . . accessible control . . . instant acting 14-point engagement sleeve clutch with built-in single stroke mechanism . . . smooth acting toggle operated holddown with individual pressure feet for varying lengths of sheets . . . triangular section cross head assuring rigid knife support for accurate cutting . . . clutch and drive gear mounted on antifriction bearings and enclosed in oiltight case for long life and low maintenance cost . . . new self-measuring ball-bearing parallel back gage providing quick operation and micrometer accuracy.

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same as the frequency of the alternator. Since the construction of the generator was such that two complete cycles were generated per revolution, frequency of oscillator multiplied by 30 gave the speed of the motor in revolutions per minute.

As a result, the best performance of the product studied was shown to be with top speeds of 15,000 to 18,000 revolutions per minute, whereas tachometers had indicated 8000 revolutions per minute. With the beat frequency oscillator used, the overall accuracy of the speed determination was 2 per cent.

Publishes Treatise on How To Read Blueprints

■ "Simple Blueprint Reading with Particular Reference to Welding and Welding Symbols" is the title of a book just published by Lincoln Electric Co., Cleveland. Compiled primarily for welders, it contains information of value to anyone concerned with mechanical construction. Its object is to provide information and instruction on reading blueprints and drawings.

The book takes the student in easy stages to a clear comprehension and mastery of the subject. While it is not intended to be an exhaustive treatise on blueprint reading, it affords a sound basis in fundamentals. By applying what he learns, and by referring to the book when questions arise, the student will be able to understand the language of draftsmen.

A detailed explanation gives the student an understanding of various symbols for different types of welds, including butt, corner, fillet, lap, etc. The 85 illustrations include practice examples of drawings of machine parts, pipe connections, general construction, tanks, and the like. Questions and answers at the end allows the student to test his knowledge.

The book contains 140 mimeographed pages, 8½ x 11 inches, and is bound in durable paper. It is available from the Lincoln Electric Co. at 50 cents per copy in the United States and 75 cents elsewhere, postpaid.

Everyday Methods for Analysis of Operations

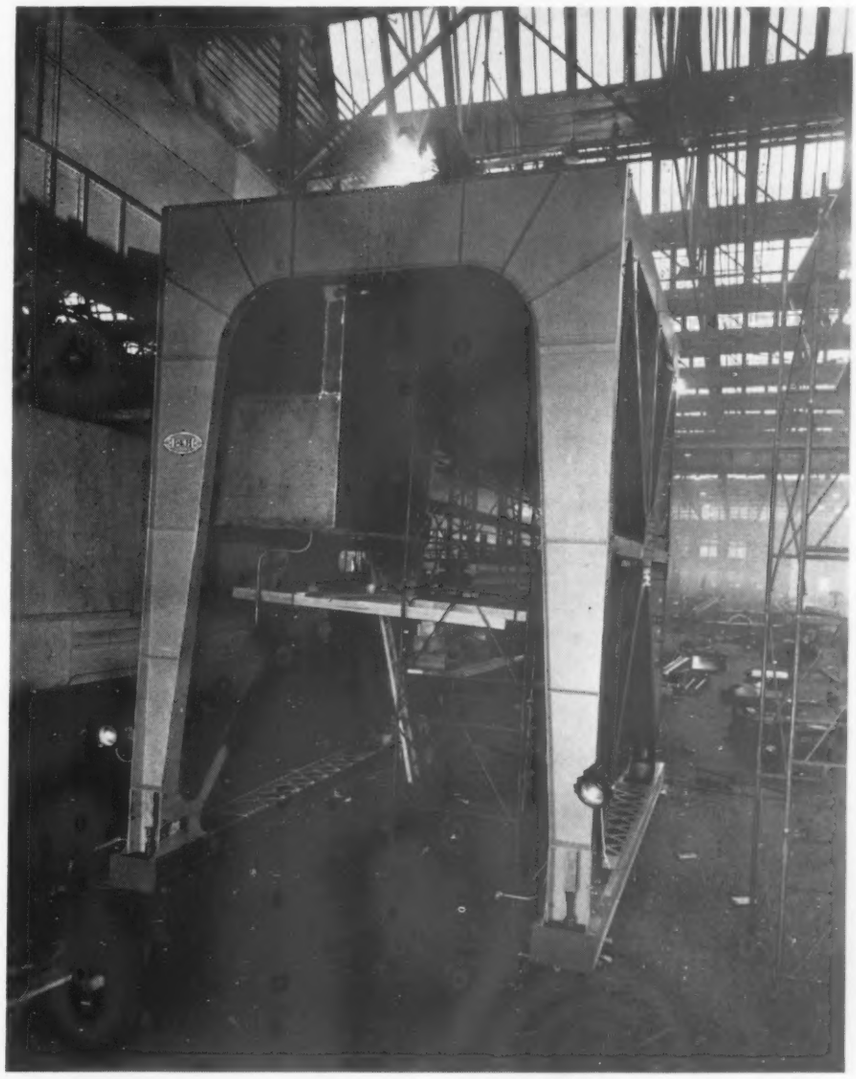
■ *Operation Analysis,* by Harold B. Maynard, president, Methods Engineering council, and C. J. Stegemerten, staff supervisor, time study and methods department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; cloth; 298 pages 6 x 9 inches; published by McGraw-Hill Book Co., New York; and supplied by STEEL, Cleveland, for $3.

This book, as the title indicates, describes procedure for conducting operation analyses. The authors claim its application is inexpensive in comparison with the purchase of new equipment and usually pays for itself many times over. Application of the procedure is not limited to trained technicians, but may be done successfully by any industrial supervisor.

It should prove of interest to progressive men connected with production activities of any industrial enterprise as well as the serious student of methods engineering procedure. The principles set forth are simple common sense, readily understandable to the practical shop man. Application of these principles is illustrated by numerous case examples.

Scope of the work is indicated by the chapter headings: Function of methods engineering in industry; approach to operation analysis; limitations of operation analysis; types of method study; field of application of six types of methods study; process charts; operation process chart; flow process charts; analysis sheet; use of the analysis sheet; operation analysis-purpose of operation; complete list of all operations; inspection requirements; material; material handling; set-up and tool equipment; ten common possibilities for operation improvement; men and machine process charts; plant layout practices; working conditions and methods; check sheet; progress process charts. Chapter division is clear and well-devised.

All-Welded Construction Reduces Crane Weight



■ **Designed for lifting the gates of a large western dam, this 20-ton gantry crane by Harnischfeger Corp., 4411 West National avenue, Milwaukee, saves 25 per cent of the weight and appreciably increases strength through use of an arc-welded alloy steel construction. All units were locally stress-relieved where necessary. With the crane standing 22 feet high, hoists were used as welding positioners to permit easy spotting of the unit**

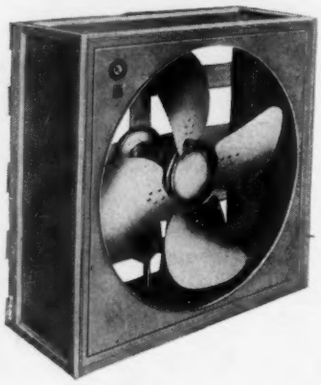
NEW METAL PRODUCTS

■ To complete its line of residential year-round air conditioning and heating equipment, York Ice Machinery Corp., York, Pa., has introduced a complete line of five new Heat Coal Stokers. Hopper feed

anthracite stoker illustrated has automatic ash remover which delivers ash directly into can. Chrome alloy coal screw resists corrosion and coal tube, cast integrally with air tube, is fluted so that coal is conveyed in a straight line, preventing grinding noises. Retort is self-cleaning as riddlings falling through air ports are returned to coal feed by reverse-acting screw, automatically preventing clogged air ports.

■ Two new popular-priced Shelvador electric refrigerators are announced by Crosley Corp., Cincinnati, O., the Leader 6 and Champion 6, both having a capacity of 6 cubic feet and a shelf area of 12½ square feet with five extra shelves in the door and provisions for freezing 70 ice cubes or 7.2 pounds of ice at one freezing. One wide shallow and one deep narrow tray for quick freezing of desserts also are provided. The steel cabinet, electrically welded in one complete assembly, is finished in durable Dulux that stays white with a minimum of cleaning. The food compartment also is one-piece welded steel with door liner finished in Dulux. Rock wool insulation is sealed in. The Leader 6 model, listing at $99.50, does not have an interior light or an evaporator door; the Champion 6 model, listing at $114.50, has a heavily porcelain-enameled food compartment with acid-proof bottom, an automatic flood light and hinged door to ice cube compartment.

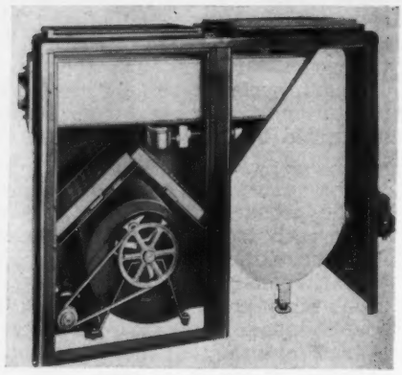
■ Attic fans developed by Chelsea Fan & Blower Co. Inc., 370 West Fifteenth street, New York, feature an external orifice for greater air delivery, balanced steel die-formed blades, rubber mounted belt tension device for quiet operation and square steel frame with self-supporting base for easy assembly. Fans



are finished in a durable high quality enamel, the frame work being light grey and blades red. Sizes range from 24 to 60 inches. Fan has Fire Underwriters' approval.

■ New tunnel liner plate known as "Armco Light-Duty" has been developed by American Rolling Mill Co., Middletown, O. Plate is interchangeable and of uniform strength from end to end. It easily installed by unskilled men using only simple tools. The new plates are available in standard inside diameters of 33 to 60 inches, 10 to 14 gage inclusive. Because of the shallow corrugated design of the light-duty plate, less excavation is required. When the tunnel liner is to be left in place, the light-duty plates can be supplied in galvanized iron, and if greater permanence is desirable, plates with a special bituminous coating are available.

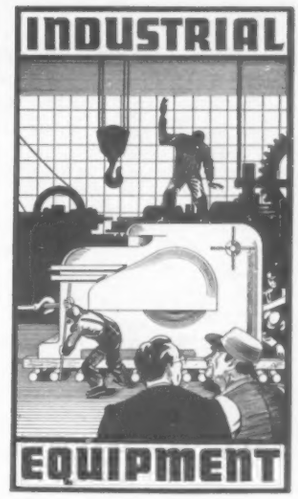
■ Heating units designed especially for operation in smaller homes have been developed by Gar Wood Industries, Inc., Air Conditioning division, 415 Connecticut avenue, Detroit.



Model 80 gas-fired Tempered-Aire illustrated provides automatic gas heating, air humidifying, air filtering and forced air circulation in winter and air filtering and power-blower, comfort-cooling effect in summer. Unit is co-ordinated, balanced heating machine consisting of exclusive teardrop firebox, fuel economizer, steamtype humidifier, air filters, multiple-vane power-blower and approved gas burner.

Model B-120-W is a hot water boiler-burner heating unit fired by new type oil burner providing stabilized sunburst flame. Unit has small boiler water content, quick boiler pickup and longer flue gas travel. It utilizes counterflow principle of heat transfer whereby coolest gases pass through tubes immersed in coolest water. Hottest gases pass through tubes in hottest water, resulting in heating economy.

■ High efficiency with any type of fuel is claimed possible with the new domestic ranges announced by Renown Stove Co., Owosso, Mich. High-speed cooking and fast, controlled baking are combined in economical units heated by coal, wood or low-cost range oil. An interesting and attractive accessory is the "chime control," which signals when the oven is properly preheated. Built-in kitchen heaters are provided for the heating of kitchens and adjoining rooms in winter weather.



Superfinishes Brake Drum in Automatic Cycle

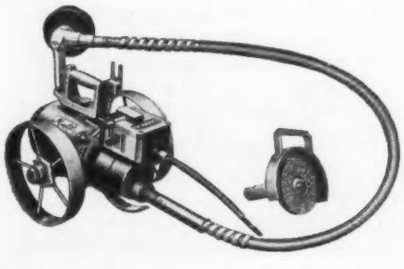
■ A new semi-horizontal brake drum superfinishing machine having a variable automatic cycle is offered by Foster Machine Co., Elk-

hart, Ind. Cycle of operation is as follows: The drum to be superfinished is placed on an adapter fitted to hub of drum and held on the adapter by an air operated draw rod. Lever at the upper right hand side is engaged to start the spindle which revolves at about 150 revolutions per minute. Roughing stones are automatically drawn over the surface which has adjustable pressure.

As the operation progresses, finish stones automatically come in shortly after the roughing stones are withdrawn from the surface, leaving the finishing stones to complete the remaining few seconds of finishing. At the end of cycle, the stone slides move back into their starting positions and the spindle automatically stops for unloading. About 15 seconds are required. Brake drum is superfinished to a profilometer reading of approximately 10 micro-inches. A better micro-inch surface may be obtained by varying the cycle of the machine but in almost all cases, a 10 micro-inch finish is considered especially fine for a brake drum surface.

Geared-Head Grinder

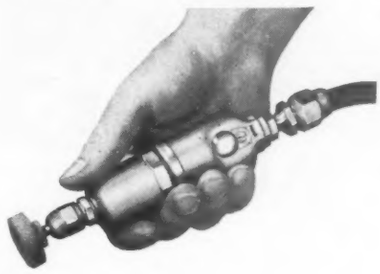
■ A geared-head grinder with two-wheel mounting is offered by Mall



Tool Co., 7740 South Chicago avenue, Chicago, powered by a totally enclosed and dustproof motor operating on 220 or 440-volt, 60-cycle, 3-phase, alternating current. Motor has high overload capacity for every class of heavy grinding, polishing and buffing and has a flexible-shaft or grinding speed of 5500 revolutions per minute. The large mounting wheels, which can be furnished with either steel rims or pneumatic tires, permit the use of this equipment on irregular floors or dirt floors.

Portable Grinder

■ A new rotary air grinder 5½ inches long and weighing 18 ounces for small-wheel work and known as the Thor "Bantam" is announced by Independent Pneumatic Tool Co., 600 West Jackson boulevard, Chicago. Operating at a free speed of 14,000 revolutions per minute, grinder will efficiently take mounted abrasive wheels of all shapes and sizes from the smallest pointed wheel up to 1½-inch diameter round



wheels. This grinder has power for continuous service and holds a nearly constant speed under load. Standard equipment includes a push-button throttle that may be locked for continuous operation of the tool, ¼-inch collet and swivel hose connection. Lever throttle may be had in place of push button.

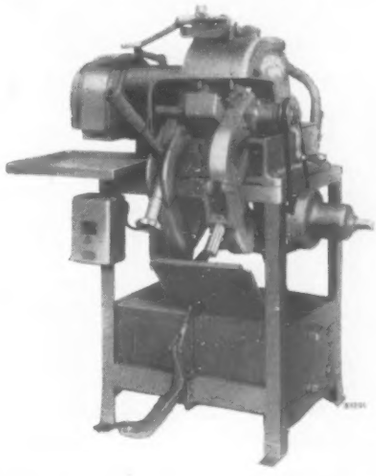
Die And Mold Dressing

■ "Bonis," diluted with approximately five times its volume of water and applied by means of air pressure or brush over hot metal surface is claimed to more than double the life of ingot molds, pots, ladles and other metal parts coming in contact with molten metal. St. John X-Ray Service, Inc., 30-20 Thomson avenue, Long Island City, N. Y., manufacturer of this new dressing, recommends its use for white metal, aluminum and brass.

Jackbit Grinder

■ Ingersoll-Rand Co., Phillipsburg, N. J., offers Size J-3 non-automatic jackbit grinder adaptable for use with all types of standard detachable rock-drill bits as used by mines and quarries. Grinder has a capacity of 35 hard bits or 50 annealed bits per hour, compared with a capacity of 60 hard bits or 100 annealed bits for the Size J-5 semi-automatic jackbit grinder. Both machines are available for electric, air, gasoline-engine or belt drive. The J-3 grinds all ordinary bits with no extra fixtures or wheel dressers required. The bit is automatically reciprocated across the face of the wheel while it is being rotated for gage grinding, thus greatly increasing the number of bits that can be ground with each individual wheel. All bearings are located outside the water zone.

Forming and gaging head yoke bearings are located underneath the grinder and collet shafts are protected by shields. Forming pressure is applied by means of a foot pedal. A cup-shaped rubber collet cushion supports the bit skirt, absorbs vibra-



tion and reduces the danger of chatter. Coolant nozzles provide large volume of coolant at exactly the right point regardless of wheel size. Gaging head is adjustable for all clearance angles from 0 to 15 degrees.

Steel-Drum Faucet Has Straight Threads

■ Steel Barrel Fittings Co., 229 Madison avenue, New York, offers a cast iron faucet with ¾-inch Briggs

straight threads for discharging contents of steel drums. Straight threads are used to eliminate the possibility of faucet disrupting threads of drum flange, as could happen if tapered threads were used. Known as the "Consolidated," this faucet has straight shank and undercut machined gasket seat. Faucets are furnished with copper or cadmium-plated or plain finish.

Improved Goggles

■ American Optical Co., Southbridge, Mass., announces all its Ful-Vue safety goggles will shortly be supplied with a new, improved type of bridge, nosepiece, and also in a new range of three eye and three bridge sizes. The new double-braced bridge is soldered at four places to the lens-frame instead of the conventional two permitted by ordinary bridges. Goggles will be supplied in three eye sizes (44, 47 and 50 millimeters) and three bridge sizes (21, 23 and 25 millimeters between lenses.

Welding Rod

■ American Manganese Steel division of American Brake Shoe & Foundry Co., Chicago Heights, Ill., offers Dieweld welding rod for reconditioning forging dies, hot and cold trimmers, shear knives, punches, cutting tools, etc. Applicable to all ferrous base metals and deposits, and with an average hardness of 55 to 60 rockwell C either as welded or heat treated, Dieweld is air-hardening as welded and must be finished by grinding.

For machining, it is necessary to bring the die or tool up to approximately 1400 degrees Fahr. and allow it to cool either within the furnace or by submerging it in asbestos, mica or some similar insulating material, after which it can be machined as easily as any ordinary steel. To reharden, it is only necessary to reheat it to between 1500 and 1800 degrees Fahr. and either air or oil quench. Dieweld is available in 3/32, 1/8, 5/32 and 3/16-inch diameters.

Ungerer Leveler

■ Edward W. Voss, 2882 West Liberty avenue, Pittsburgh, is manufacturing in this country and marketing Ungerer Roller Levelers. Over 150 designs employing from 9 to 23 leveling rolls are available. Roll deflection and radial yoke tilt are provided in all machines.

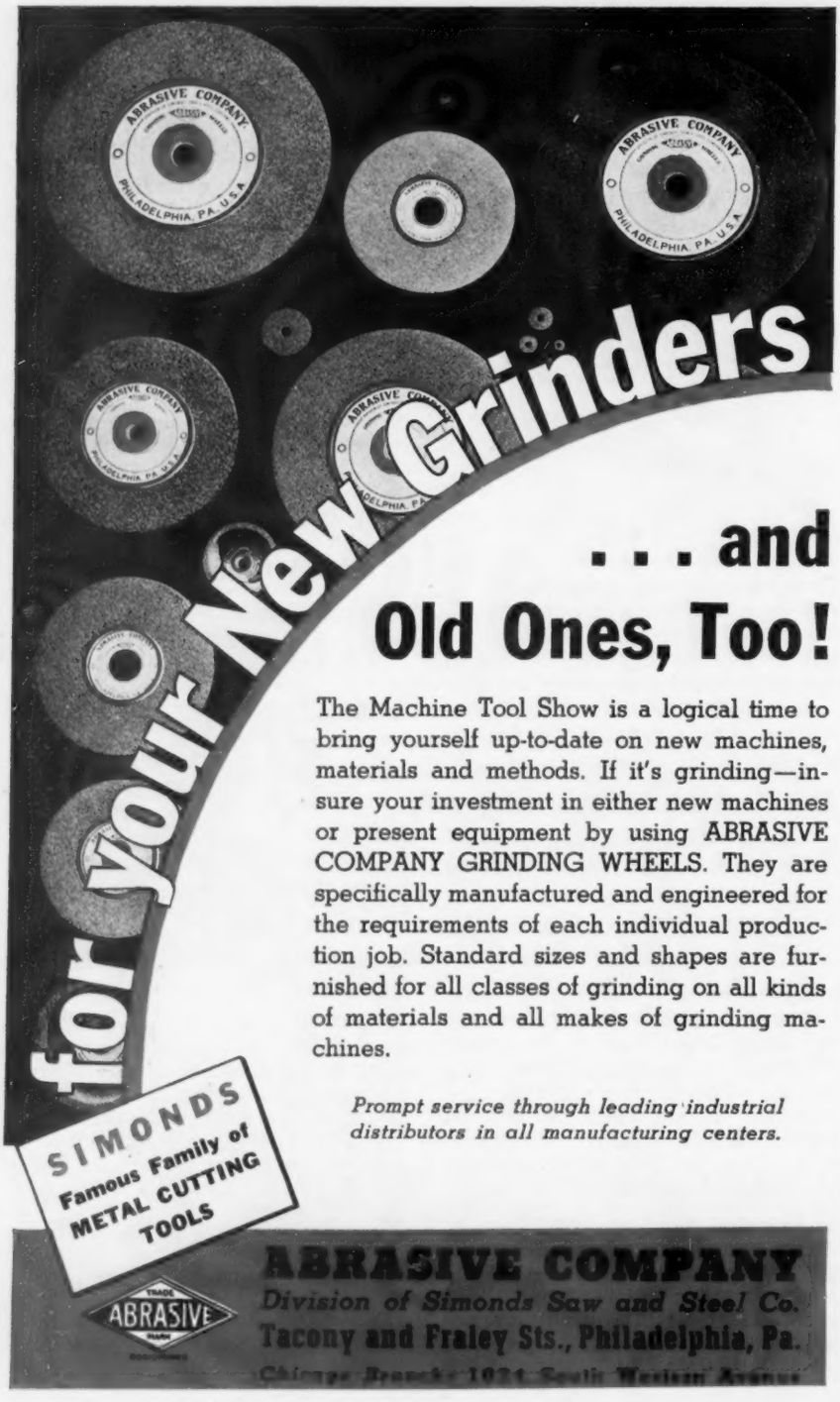
Time Starter

■ General Electric Co., Schenectady, N. Y., announces new direct-current definite-mechanical-time starters for general-purpose constant-speed motors where jogging is not required. Rating is up to 5 horsepower, 115 volts and 10 horsepower, 230 volts, and they consist of a solenoid-operated multifinger contactor with overload relay and a time-delay escapement mechanism. In constant engagement with the operating shaft, this mechanism restrains the shaft in the starting motor, but permits quick opening through the action of a positive over-running clutch.

A new isothermic overload relay makes possible improved overload protection, for it works on the heater and bi-metallic strip principle, and it is easily set for either manual or automatic resetting after overload. For quick arc interruption, a blowout and arc chute on the line contact is included in the multifinger contactor. These starters may be applied to constant-speed motors up to 1800 revolutions per minute that do not require more than 150 per cent of full-load torque to start nor longer than 10 seconds to attain full speed. With the proper accessories, the starters will provide overload and undervoltage protection.

Spray-Finishing Machine

■ A new light-duty, rotary, spray-finishing machine, known as Type YB-5103, with a production range of 400 to 3000 articles per hour is announced by DeVilbiss Co., Toledo,


for your New Grinders
. . . and
Old Ones, Too!
The Machine Tool Show is a logical time to bring yourself up-to-date on new machines, materials and methods. If it's grinding—insure your investment in either new machines or present equipment by using ABRASIVE COMPANY GRINDING WHEELS. They are specifically manufactured and engineered for the requirements of each individual production job. Standard sizes and shapes are furnished for all classes of grinding on all kinds of materials and all makes of grinding machines.
Prompt service through leading industrial distributors in all manufacturing centers.
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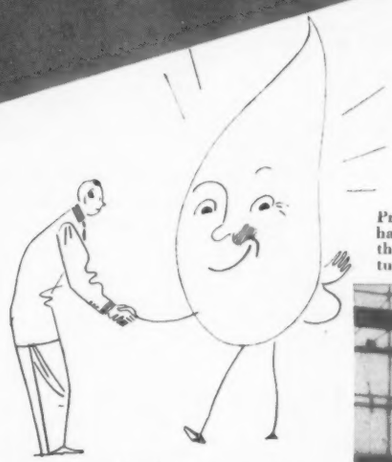
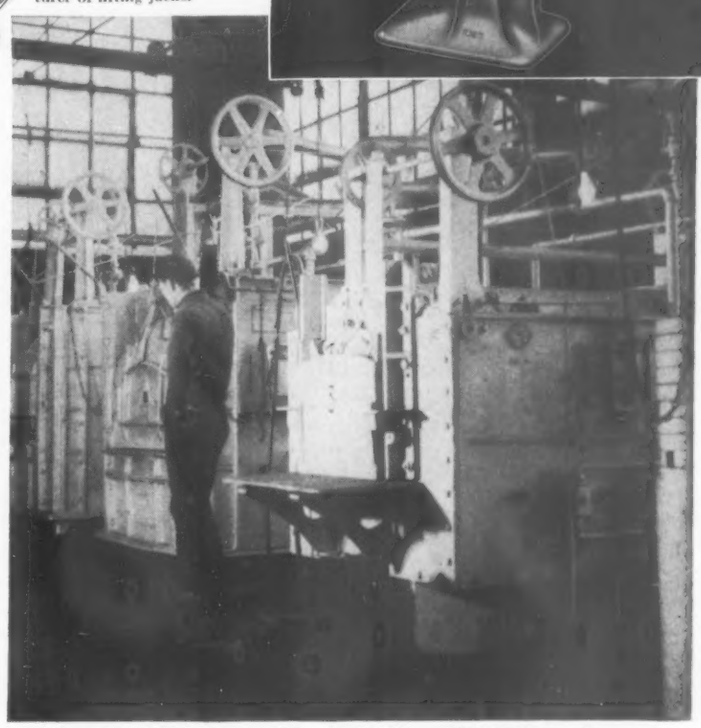
Duff-Norton Jacks Up Heat Treating Efficiency the Modern GAS Way



Proper heat-treating with GAS has helped make Duff-Norton the world's leading manufacturer of lifting jacks.



Three of the GAS furnaces used by the Duff-Norton Manufacturing Company for hardening, annealing and normalizing of steel products. Burners by Universal Burner & Mfg. Co., Blawnox, Pa. Photo courtesy of Equitable Gas Company, Pittsburgh.

Would you like to cut your fuel consumption in half as Duff-Norton are doing? Instead of waiting three hours to begin heat treating operations, would you like to get going about 45 minutes after you start up your furnaces?

The Duff-Norton Manufacturing Company, the world's oldest and largest manufacturers of lifting jacks, are getting that kind of performance from their modern, oven-type GAS furnaces, enabling them to produce highly efficient, fool-proof tools, the parts of which are capable of withstanding severe strains and intense friction as a result of the accurate heat treatment to which they are subjected.

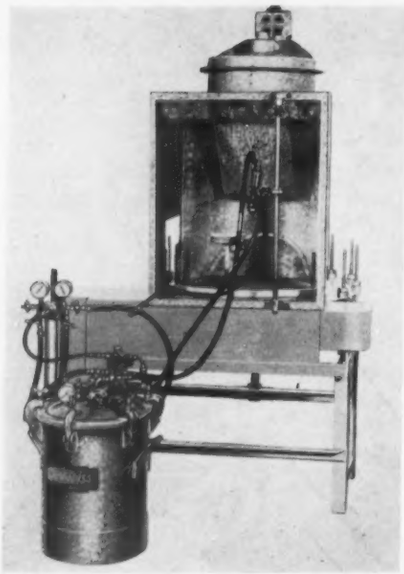
Hardening, annealing, carburizing, normalizing . . . all of these and many other heat treating operations can be handled more efficiently and more economically with modern GAS furnaces. Is your plant keeping pace with the swing to present day GAS efficiency?

THE TREND TODAY IS TO GAS
FOR ALL INDUSTRIAL HEATING

AMERICAN GAS ASSOCIATION

INDUSTRIAL GAS SECTION

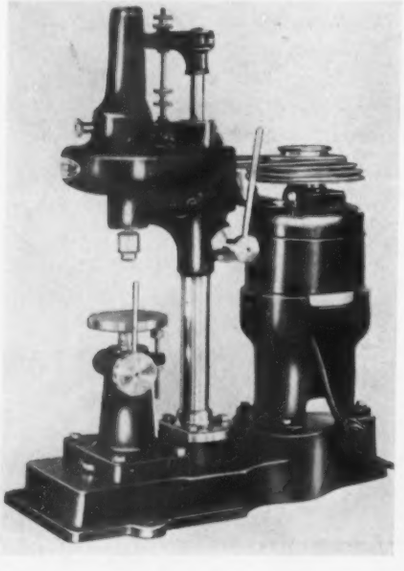
420 LEXINGTON AVENUE NEW YORK CITY



O., for fast, semi-automatic finishing of parts such as automobile horns, lipstick cases, radio bulbs, lamp shades, etc. Installation of proper workholders permits finishing of a variety of different parts on the same machine. Length of spraying period per cam is adjustable to the point of maximum efficiency and economy, and the automatic spray gun and air control valve hold spraying rigidly to adjustment made. Turntable is 34¼ inches in diameter and carries 15 spindles, each of which rotates on ball bearings.

Super-Sensitive Drill Has Fixed Spindle

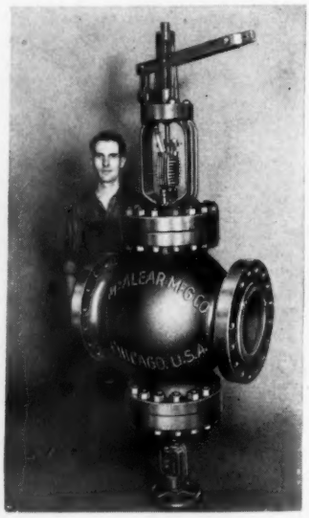
■ The High Speed Hammer Co. Inc., Rochester, N. Y., announces a new drill with drilling range from 0.004 to ¼-inch diameter inclusive and having a super-sensitive table for drills No. 80 (0.0135) and smaller. The spindle is locked in a fixed position and the work and table are fed upward to the drill. For drilling holes No. 60 to ¼-inch, table is locked in any desired position, and spindle is operated in conventional manner. Standard spindle speeds are 750, 1500, 3000 and 6000 revolutions per minute.



Large Lever Valve

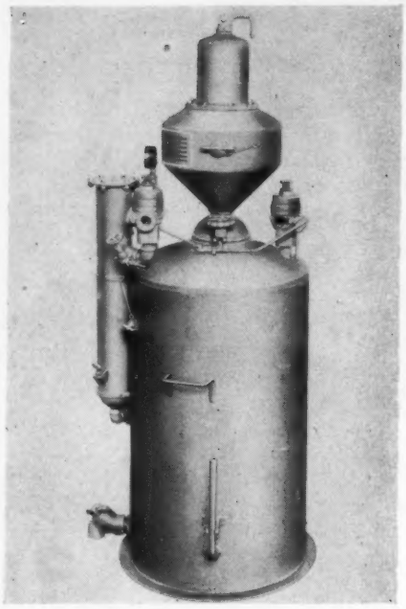
■ A McAlear Special No. 373 lever valve, shown in accompanying illustration, was supplied by the McAlear Mfg. Co., 2431 Scotten avenue, Chicago, for an installation made by the Askania Regulator Co., 1603 South Michigan avenue, Chicago. The valve is controlled by an Askania oil cylinder and maintains a constant reduced steam pressure over a wide range. The steam supply pressure to the valve is 500 pounds per square inch at 675 degrees Fahr., and the controlled downstream, or delivery, steam pressure is 150 pounds. The valve readily handles flow variations up to 500,000 pounds of steam per hour at the above pressures.

The valve has a cast steel body, Series 60, with large female and male flange facings, inlet and outlet, respectively. It is reverse-seated, double-seated with parabolic plug of SAE 3140. The parabolic plug gives a very close throttling range, the first 50 per cent of the valve stroke giving about 30 per cent maximum capacity. To withstand the severe service and to prevent wire drawing and wear, the plug seating surface, seat rings and plug guide spindles were Stellited.



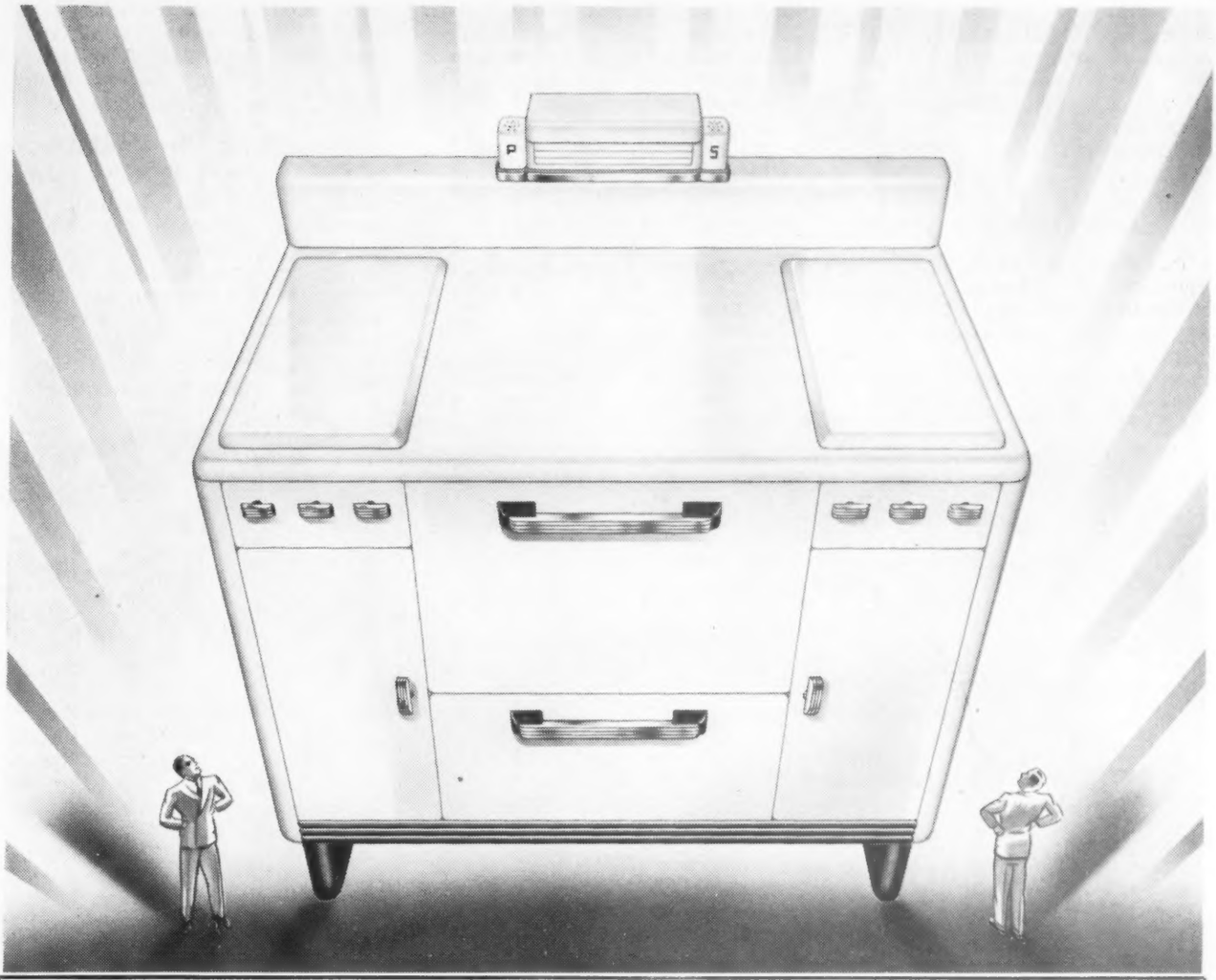
Medium Pressure Acetylene Generator

■ An acetylene generator, known as Oxweld MP-9 medium-pressure acetylene generator and designed to combine portability with the operating advantages found in larger units, is announced by The Linde Air Products Co., 205 East Forty-second street, New York. The MP-9 holds 25 pounds of size 14 ND Union Carbide and will deliver as much as 50 cubic feet of acetylene per hour at any desired pressure up to 15 pounds per square inch. The generator produces a smooth flow of clean, dry acetylene with no appreciable variations in pressure which is particularly valuable in maintaining a stable blowpipe flame. Operation of the generator is extremely simple since only one handle is used to start or stop generation of the acetylene and to adjust the delivery pressure. Generator has two relief valves, a large hydraulic back-pressure valve, which prevents the carrying over of water to the hose and an interference mechanism which allows only the proper sequence of operations during recharging.



Tractor Cable Control

■ A new single-drum, rear-mounted cable control for "Caterpillar" tractors and bulldozers has been developed by Caterpillar Tractor Co., Peoria, Ill. The control lever, located at the forward right hand side of the operator, permits full attention to the work from a most natural and comfortable position. With the lever in center position the drum is locked in neutral (brake on); drawn in toward the operator, the drum reels in cable; moved away from the



PROFITS

Reflect the Quality of GRANITE CITY ENAMELING SHEETS

Users of Granite City Porcelain Enameling Sheets enjoy unusual consistency in the production of fine finished enameled products. Rejects are scarce, and seldom caused by the steel. This freedom from wasted labor and materials, plus the greater smoothness with which Granite City Sheets take enamel, means more production at lower cost—hence greater net profit.

Granite City Enameling Sheets are produced with extreme care in a mill which was founded sixty years ago for the single purpose of making fine enameling sheets. This experience, together with new, modern equipment, accounts for the uniformly high quality of the product, which is characterized by excellent drawing quality, freedom from warpage and blistering, absence of non-metallic inclusions, ease of welding, clean sheets and proper flatness.

Granite City Steel Company

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operator the drum allows cable to unreel. The lever position is adjustable to suit operators. Attachment or removal is quick and easy and all adjustments are external, easily accessible. Seat risers are included as part of control unit assembly.

New Transmission Units

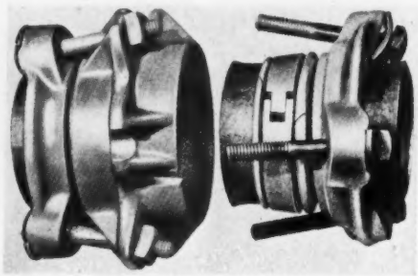
■ Two new sizes of P. I. V. gear variable-speed transmission units are announced by Link-Belt Co., 2045 West Hunting Park avenue, Philadelphia. They are No. 0 size, ½-horsepower, for speed ratios of 2 to 1 or 3 to 1; and size No. ⅛, 1½-horsepower, for ratios of 2 to 1, 3 to 1, 4 to 1. These smaller sizes, like the larger units, ranging up to 15-horsepower and up to 6 to 1 speed ratio, can be furnished for horizontal or vertical mounting, motorized or without integral motor and with or without extra speed reduction gear sets.

Plumb-Bob Has Self-Contained Cord Reel

■ A plumb-bob, "Jiffy-Bob," is announced by J. A. Honegger and associates, Bloomfield, N. J., featuring an internal reel for winding of the cord. Length of cord can be adjusted in use to from 1 to 8 feet by winding or unwinding to desired length and then tightening two knurled nuts to lock it in position. Plumb-bob sells for less than 50 cents.

Threadless Pipe Fitting

■ Gibbons Mfg. Co., Worcester, Mass., offers anti-deflective, pressure-proof, plain-end pipe fittings hermetically sealed for water, gas, sewage, oil, chemicals, etc. The rubber-coated lead bushings on the pipe have tremendous grip, very little movement of the collar being necessary to increase it. This is due to the inner lock ring's preventing any



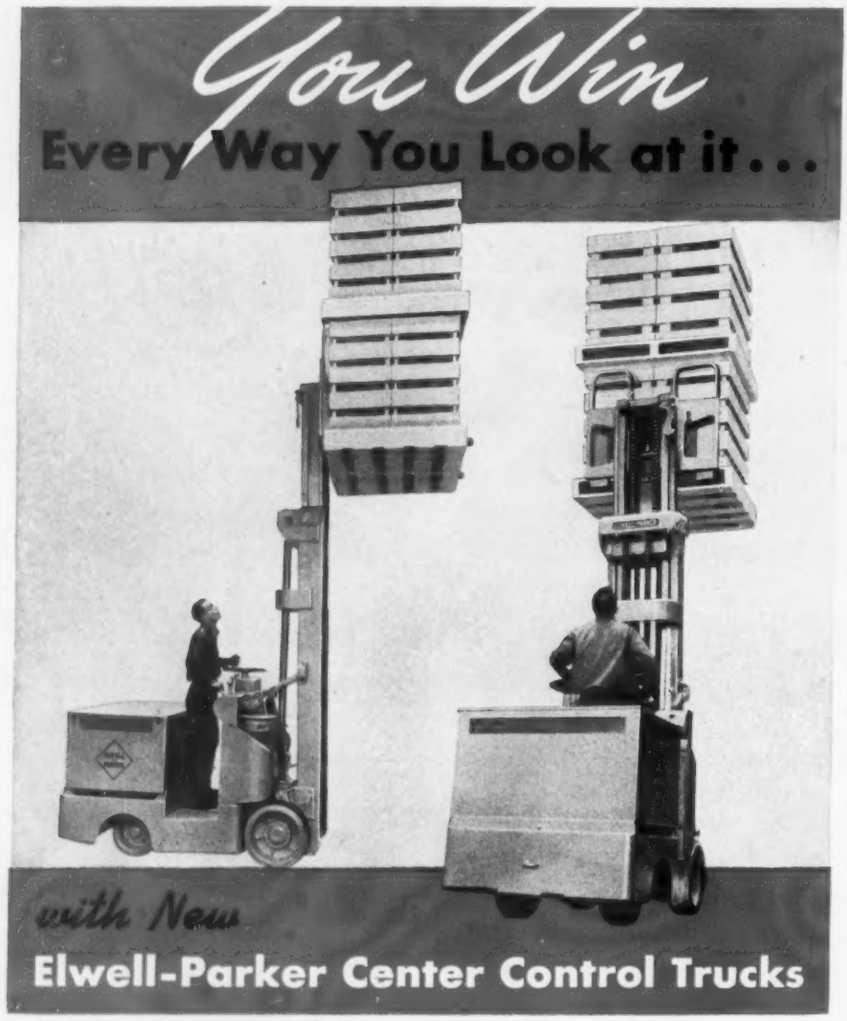
of the bushing from seeping through at this point. What seeps through at the outer lock ring position is under great pressure, and the pressure increases as the ring nears the body of the fitting. When the ring and body contact, the pressure is hermetically sealed permanently. The flare on the pipe generated by the roll cutters is used to advantage for taut strength, locking itself between the shoulder of the body and the flexible pressure bushing, which compensate for any contraction or expansion of the pipe. These couplings are available in two styles, shoulder and nonshoulder, and are carried in stock in from 1½ to 12-inch standard pipe sizes. Larger sizes can be had special up to 40-inch pipe. All pipe should be machine roll cut so as to have the added advantage of the flare generated by the rolls for added taut stress.

Welding Electrodes

■ Four new welding electrodes called Page Surface Saving electrodes have been added to the line manufactured by Page Steel and Wire division of American Chain & Cable Co., Inc., Monessen, Pa. These electrodes are alloyed to meet the demand for tough abrasion resisting materials for the original surface maintenance and repair of metal parts subject to excessive wear. They all interalloy with the base metal when applied by the metallic arc method.

Small Linestarter

■ A new, small inexpensive across-the-line starter for ratings up to two horsepower, 220, 440 and 550



You win! Elwell-Parker offers new, down-to-the-minute Center Control Trucks in 5 completely separate sizes and capacities. **Choice!**

You win! Center Control design by Elwell-Parker gives operator improved visibility by bringing him closer to his load; by providing increased safety, better control of Truck and load in close quarters. **Adaptability!**

You win! Operating mechanism in all Elwell-Parker Center Control Trucks is identical with same equipment in widely-used, *proven* Elwell-Parker Rear-Control Trucks of corresponding sizes. **Interchangeability!**

Select the Truck best adapted to *your* needs from 10 Standard Elwell-Parker Models, with correct attachments to fit. Write or wire today.

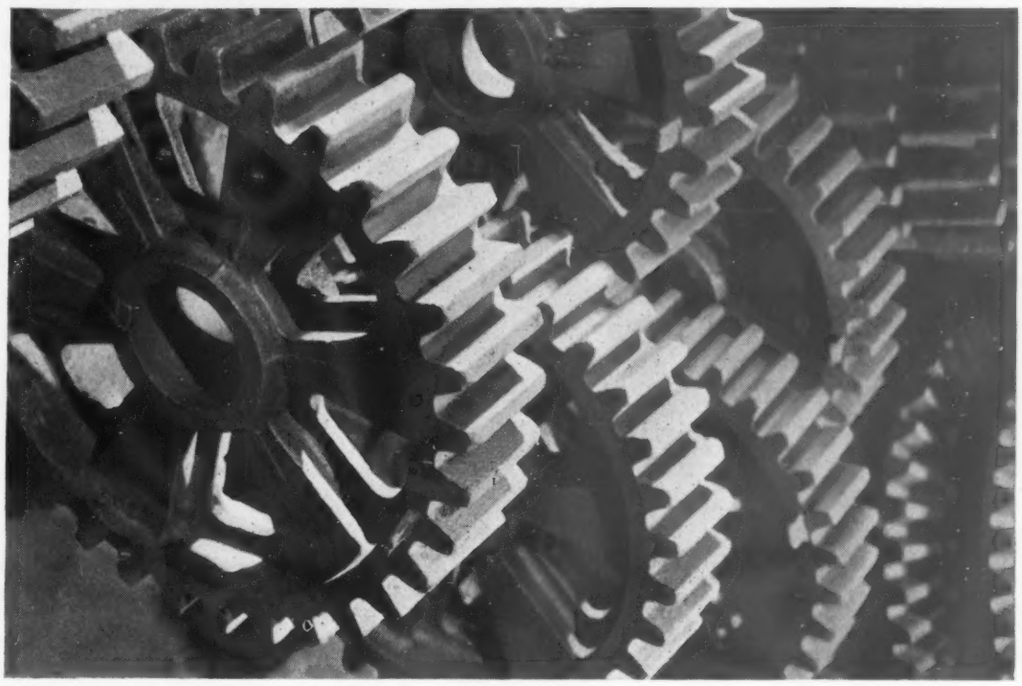
The Elwell-Parker Electric Company, 4501 St. Clair Avenue, Cleveland, Ohio.

ELWELL-PARKER *Power Industrial* **TRUCKS**

ESTABLISHED 1893 • BUILDING POWER INDUSTRIAL TRUCKS SINCE 1906

CAST STEEL GEARS

are Strong · Quiet · Rigid Economical · Wear Well



All industry knows the importance of dependable gears — the parts of any machine that make it work.

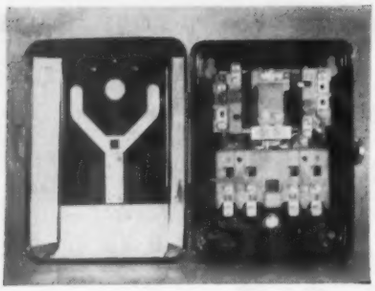
Cast steel gears start with solid, homogeneous and uniform metal, with no flow lines concentric with rim to cause tooth breakage. Machining of blank gears is quick, easy and accurate, and differential hardening of parts presents no problem. Gears with cast teeth eliminate much costly machining.

And as is true of all properly designed steel castings, there is strength without excess weight, less waste stock for machining. A wide variety of mechanical properties is available.

Whatever you build, steel castings can bring you all of these money-saving advantages, plus a better, more dependable finished product. Discuss the subject with your own foundry, who will gladly work with you on these improvements. Or, if you prefer, there is no obligation involved in writing for information to Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.

IMPROVE YOUR PRODUCT WITH

STEEL CASTINGS



volts, 2 and 3-phase and equivalent ratings on single-phase, is announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for starting of squirrel-cage induction motors and as primary switch for wound-rotor induction motors on machine tools, conveyors, pumps, etc.

This starter is available as plain across-the-line starter or in combination with motor circuit switches and Nofuze circuit breakers in standard enclosures. Principal features include de-ion arc quenching and snap action bi-metal disc overload relay.

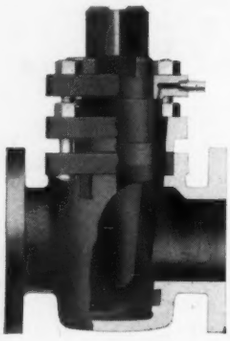
Fluorescent Reflector

■ Reflectors, Inc., 3225 Frankford avenue, Philadelphia, announces reflecto-Duct reflector for fluorescent lighting. Unit of heavy-gage steel

spot welded and bonderized has white porcelain-like finish inside and antique bronze finish outside. Open ends allow continuous trough lighting. Reflector may be suspended by wire or chain. Reflector is listed by Underwriters Lab. Inc. re-examination service.

Groove-Packed Iron Cock

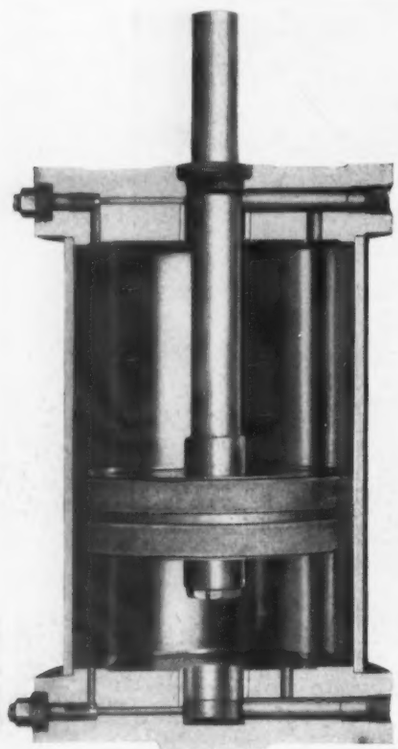
■ Asbestos groove-packed iron cocks are announced by the Reading-Pratt & Cady division of the American Chain & Cable Co., Inc., Bridgeport, Conn., having separately con-



trolled pressure on the plug and packing resulting in a 50 per cent reduction in the effort required to operate the cock and less wear on the moving parts. This new type has the usual gland to hold the plug in position and an additional gland to compress the top packing. Alemite lubrication is provided through a groove between the top of the plug and the top gland. R-P & C dual gland cocks are made in sizes from 1½ to 6 inches for 125-pound and 250-pound steam pressures. For corrosive or high-temperature services, they can be supplied made from Ni-Resist nickel-chrome iron.

Electrode Gives Smooth Welds For Finish Beads

■ A new arc welding electrode, which will facilitate finishing operations on welded products by eliminating the need of dressing or smoothing welded seams in many applications, has been developed by Lincoln Electric Co., 12818 Coit road, Cleveland. The new electrode, known as "Fleetweld 10," is designed particularly for finish bead welding on U-groove welding in downhand position and provides full slag coverage and a smooth weld deposit. The bead is uniform and regular without square shoulders and smooths



TOWARD YOUR BETTER PRODUCT

T-J

announces - - -

HARD CHROMIUM PLATED *cylinder walls and piston rods - - -*

During intervals of non-use and before installation, cylinders are ordinarily susceptible to rust. From the various methods of preventing this condition, Hard Chromium plating was selected because, in addition to its ably solving the rust problem, it becomes an important factor in increasing the efficiency of the cylinder. The same moisture (from the condensation of compressed air) or water (when the cylinder is used for water-hydraulics) which would ordinarily cause corrosion, now acts as a lubricant on these hard chromium plated bodies and piston rods actually increasing the "slickness" of the surface. This in combination with the polished, smoother surface obtained means less friction and prolonged packing life. Of no less importance is the fact that these cylinders with this new feature are now being furnished *at no extra cost.*

More "service" features are described in our catalog No. 36-A. It will assist you in selecting the type of cylinder that will help you *toward your better product.*

this is a **TOMKINS-JOHNSON** *product*

Factory at 611 N. Mechanic St., Jackson, Michigan. Agents in principal cities. T-J products also include Oil Hydraulic Cylinders . . . . Remote Control Systems . . . . Rotating Chucks and Cylinders . . . . Rivitors . . . . Clinchors . . . . Special Equipment . . . . Brownie Coolant Pumps . . . . T-J Die Sinking Milling Cutters.

out evently during welding. Finish beads can be made in V-butt joints in flat position which are flush with the surface of the plates. The line of fusion with the base metal is practically unnoticeable and the surface of the bead has much less of the "rippled" effect which characterizes the usual weld deposit. "Fleetweld 10" can be used with either normal or reverse polarity with direct or alternating current and is made in two sizes in 18-inch lengths, ¼ and 5/16-inch.

Cutting Torch

■ A new cutting torch, Meco Cutmaster, made by Modern Engineering Co., 3405 Pine boulevard, St. Louis, has a head mixer claimed to provide a perfect mix of preheating gases. The connection of tip to head eliminates leakage between high pressure passageways into the preheating passage as well as open leaks that endanger the operator. The high pressure oxygen valve is

controlled by a long lever, mounted on top, and because of the leverage, the pressure required to operate the valve is negligible. A thumb-operated locking device is placed at the end of the control level. Torch is of 3-tube construction with tubes of monel metal for maximum heat resistance as well as structural strength. All other parts are of forged and extruded metals.

Aluminum Paint

■ The Skybryte Co., 3125 Perkins avenue, Cleveland, announces a new ready-mixed aluminum paint, "Fence-Bond," specially formulated for painting rusted chain link fence without removing the rust. The base oils are of penetrating type which creep into all joints and contact points, sealing the rust against further corrosive action. "Fence-Bond" is said to dry from the "outside," retaining a firm elasticity which is able to withstand the movement of the joints without chipping.

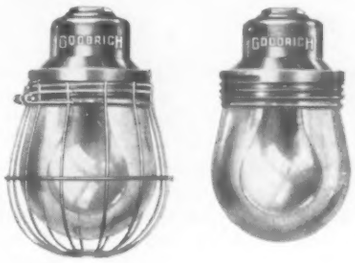
Individual Motor Drive

■ The Torq Electric Mfg. Co., 6609 Carnegie avenue, Cleveland, announces AV Torq individual motor drive with V-belt reduction for lathes, milling machines, screw machines, etc., and BC Torq drives with chain reduction for use on shapers. AV units incorporate variable belt tensioner. BC type has cam-operated belt tensioner. Chain reduction is completely enclosed, silent and runs in oil. All drives are complete with mounting brackets and either V-belts and V-belt pulleys (including motor pulley) or chain reduction unit.

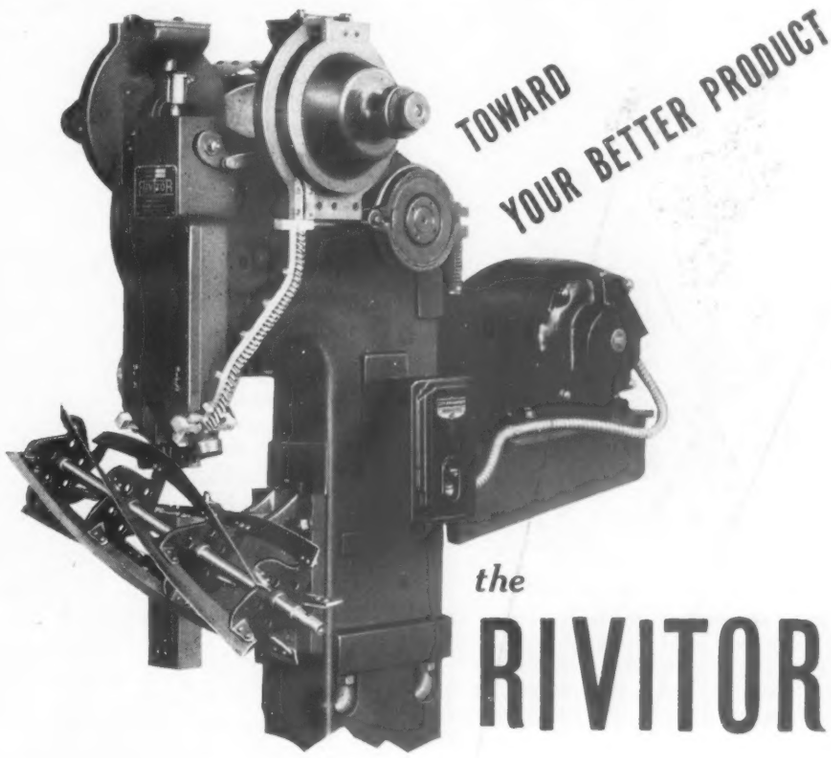
Dust-Proof Light Unit

■ A dust-proof lighting fixture for use in coal pulverizing plants and similar locations has been developed by Goodrich Electric Co., 2900 North Oakley avenue, Chicago. The new fixture has heavy threaded clear glass globe and one-piece copper hood, which may be fitted with heat-resisting daylight blue, ruby or diffusing globes, as well as the clear globe which is standard.

The fixture is equipped with a resilient socket, which is easily removed for quick wiring, and is approved by the Underwriters Labora-



tory for use in Class II, Group G, hazardous locations where com-



effects a stronger riveted joint at rates up to 3200 rivets an hour and creates additional savings by making possible the use of solid rivets.

The riveting is accomplished smoothly, automatically and with precision. The setting action is actually one of "Coining". The motion proceeds from a fast approach to the riveting position to a slower setting action—giving the metal time to flow.

The Rivitor is shown here "staking" $\frac{3}{16}$" x $\frac{5}{8}$" lg. solid rivets for reel and blade assembly.

These machines ably handle many jobs in many industries. Submit samples of your riveting jobs. We should like to show you the type of solid rivet joints that can be effected automatically. We should like you to realize savings that will help you *toward your better product.*

this is a* TOMKINS-JOHNSON *product

Factory at 611 N. Mechanic St., Jackson, Michigan. Agents in principal cities. T-J products also include Air and Hydraulic Cylinders . . . . Remote Control Systems . . . . Rotating Chucks and Cylinders . . . . Clinchors . . . . Special Equipment . . . . Brownie Coolant Pumps . . . . T-J Die Sinking Milling Cutters.

bustible dust may be suspended in the air in sufficient quantities to produce explosive mixtures. Lamp sizes from 25 to 150 watts are accommodated.

Automatic Miller

■ U. S. Tool Co., Inc., Ampere, N. J., announces MM-52 Multi-Miller with cam-controlled automatic vertical feed of the spindle head. By synchronizing the vertical feed and cam controlled table feed, this machine can be used for profiling operations.

One operator can attend to as many as six machines since he is required only for loading and unloading.

A typical cycle includes quick approach to cutting positions cut at one level, cut vertically to second level, cut at second level, raise spindle to clear and quick return to loading position. Any contour within the range of the 2-inch vertical motion and 6-inch table movement also can be milled.

New Speed Reducers

■ A new line of worm-helical speed reducers in 15 standard ratios ranging from 40 to 1 to 250 to 1, for all the common motor speeds and horsepower ratings, is announced by W. A. Jones Foundry & Machine Co., 4401 Roosevelt road, Chicago. This type of speed reducer was developed especially for vertical shaft drives on agitators, mixed, etc., where a large reduction in speed is required.

Continuous Cold Drawing Straightening Machine

■ Ajax Mfg. Co., 1414 Chardon road, Cleveland, announces continuous drawing and straightening machines for producing straight cold drawn bars which are accurate to size and commercially straight after one pass through the machine. The

grips in the drawing and feed slides prevent the bar from turning, eliminating the possibility of a round bar rotating enough to snake through the straightening rollers and escape overbending.

♦

Story of Schwab's Life

(*Concluded from Page* 30)

lenging "7" written instead. The night shift had announced itself. That night Mr. Schwab passed again. The "7" had been obliterated and a "10" swaggered in its place. The day force recognized no superiors.

For extra efforts, Mr. Schwab was generous with bonuses. When asked to build 20 submarines for Great Britain during the last war, time was at a premium. Mr. Schwab agreed to build them in nine months, paying a penalty for any extra time required and collecting a premium if the task were completed earlier. Despite unexpected difficulties, the job was finished in less than six months. A $2,500,000 bonus was divided. One foreman received $100,000.

Resigned Directorates at 70

When he reached 70, Mr. Schwab resigned most of his directorates. He was determined, however, to remain with his pride—Bethlehem. "I'll never resign from Bethlehem unless they kick me out," he chuckled.

Mr. Schwab's funeral at St. Patrick's Cathedral, New York, Sept. 21, was attended by hundreds of financial and industrial leaders. Pallbearers were: Eugene G. Grace, president, Bethlehem Steel Co., Quincy Bent, R. E. McMath, Archibald Johnston, Paul Mackall, C. A. Buck, G. H. Blakeley, J. M. Larkin, F. A. Shick, S. W. Wakeman, C. R. Holton, Norborne Berkeley, C. D. Marshall, J. M. Gross, Roy A. Lewis, H. S. Snyder, Hoyt A. Moore, and P. D. Cravath. All are directors or officials of Bethlehem except Mr. Snyder, who was for many years with Bethlehem but now is retired, and Mr. Moore and Mr. Cravath, who are legal counsel for the corporation.

Following the services the body was placed in the vault of the Gate of Heaven cemetery, Westchester county, New York.

Mirrors of Motordom

(*Concluded from Page* 38)

from a precipitate obtained in the second reaction tank. Removed as a wet cake on a rotary vacuum filter, it is essentially a basic calcium salt of lignin sulphuric acid and is known as an organic product or OP. This OP may be converted to use as lignin plastics or may be used as boiler fuel.

The company is developing a complete line of plastics which ultimately will include (1) lignin core and surface sheets for laminating, (2) lignin molding compositions for positive, injection and impact molding, and (3) modified lignin resins for coating, impregnated and adhesives. Production has been started on the first of these, and core sheets will be available in rolls of any width from 4 to 100 inches, or in sheets cut to size and shipped flat. These sheets are thermoplastic but are not thermosetting unless deliberately made so by use of auxiliary agents. Unmolded sheets are brown in color and mold to a black under usual molding pressures and temperatures.

Core or laminated sheets are said to have excellent nailing, punching and machining qualities and in general the same operations used in machining other laminated plastics and metals are applicable. Specific gravity is 1.36-1.40; tensile strength, 8000-15,000 pounds per square inch; compressive strength, 25,000-35,000 pounds per square inch; flexural strength, 11,000-25,000 pounds per square inch; impact strength, 1.5-2.0 foot-pounds; molding temperatures up to 392 degrees Fahr., pressures 1000-2000 pounds per square inch; and water absorption in 24 hours, 0.5-3.0 per cent.

The company does no laminating or molding work, but proposes to manufacture and sell the unmolded sheets in forms and grades suitable for various laminating purposes.

High-frequency induction heating for internal surfacing hardening, referred to in STEEL for July 24, p. 30, is being carried out here by Budd Induction Heating Inc. This company recently purchased from Westinghouse Electric & Mfg. Co. a 9600-cycle, 500-kilowatt hydrogen cooled generator for experimental work in this type of steel hardening. Use of hydrogen as a coolant in frequency-converter units of this small rating is said to be new, but is claimed helpful in increasing efficiency, reducing weights and dimensions, and lowering maintenance costs. Specifications call for a speed of 3600 r.p.m. and the set to be totally enclosed. Internal gas pressure can be relatively high and can vary over a relatively wide range.

Safe Practices

(*Concluded from Page* 52)

dangerous, as any false move on the part of the workman holding the pinch bar might easily cause serious injury to the other mechanic.

A simple solution to this unsafe practice was found by drilling the spindle and housing of the coiler so a pin could be used to hold the drum in the "up" position. With this arrangement, it is unnecessary for a mechanic to have his hands underneath the drum until the safety pin is in place.

When changing bearings on a small vertical edging mill by means of slings, the workman may accidentally have his fingers between the cables when the piece is lifted. In this instance a simple double hook was developed to eliminate possibility of injury.

Roll-Changing Bar Improved

A roll-changing bar commonly used on small mills at times caught a workman's foot underneath the bar when it was rolled onto the floor. The welding of a disk onto the bar near its outer end not only keeps it above the floor, but also makes it easier to roll out of the way.

When charging a bar-mill furnace by sliding billets over a roller support, a workman's hands may become pinched between the supporting roller and the billet. To prevent such an occurrence, a pair of pinch rolls was installed on the furnace to move the bar and to eliminate most of the hand pushing previously required.

Another dangerous practice was for a workman to remove a cobble from a flying shear by standing on the driving arms. Performing the work in this position, it was possible for the workman to be crushed in event the shear was started. An enclosure built over the operating arms eliminated this danger.

In billet storage where different lifts are separated from each other by means of wooden four-by-fours, the handling of billets in and out of the storage was dangerous as the blocking may crush and catch a man's arm or foot, or it may spring out and strike one of the men, if not placed properly.

In modern billet storage, steel uprights separate the piles in a horizontal direction. Chains are wrapped around each pile and allowed to remain with the billets until they are removed from a stock. Dangers formerly existing have been eliminated by this better practice.

These are but a few of many improvements which make possible excellent safety records in modern steel mills.

Formulary Covers Wide Field in Chemistry

■ *The Chemical Formulary*, by H. Bennett; cloth, 638 pages, 5½ x 8½ inches; published by the Chemical Publishing Co. Inc.; supplied by STEEL, Cleveland, for $6.

This new 1939 edition provides a mine of useful information, the boiled down essence of the latest commercial methods of hundreds of chemists, engineers, technicians and professors. It shows not only ingredients and quantities to use, but explains in full every step in production of many finished materials.

The book contains thousands of formulas and receipts for making innumerable products for use in the factory, office, home and school. Contents cover adhesives, beverages, cosmetics and drugs, emulsions, farm and garden specialties, foods, inks, leather, lubricants, materials of construction, paints, paper, photography, plating, polishes and abrasives, pyrotechnics, rubber, resins, plastics, waxes, soap and cleaners, textiles and fibers, miscellaneous, references and acknowledgements, tradenamed chemicals, etc.

Capacity Doubled by DRAVO

Does the work formerly requiring two bridges

● The Pittsburgh Coal Company operated two 6-ton coal bridges at their Superior, Wis., docks. One bridge alone was incapable of handling the total traffic, yet the operating costs of the two bridges constituted too great an overhead. Dravo designed a man trolley of aluminum, greatly increased the speed of travel without over-stressing the structure, and raised the capacity of one bridge to 12 tons. By eliminating the use of the second bridge, operating costs were reduced proportionately.

Whether the problem is one of modernizing old equipment, replacing obsolete handling machines or designing special facilities to meet new problems, consultation with Dravo Corporation may prove to be of great value to you. Added to its ability to fabricate and erect, design and put into commission ideas as shown above, Dravo Corporation has had years of experience building docks, retaining walls, plant foundation—everything that enters into the problem of terminal facilities. Bulletin 403 describes mill foundations and terminal equipment. Bulletin 202 describes revolving cranes. Either will be sent on request. Inquiries relative to specific problems may be addressed to

DRAVO CORPORATION

ENGINEERING WORKS DIVISION

SHIPYARDS: PITTSBURGH, PA.—WILMINGTON, DEL.
GENERAL OFFICES AND SHOPS: NEVILLE ISLAND—PITTSBURGH, PA.

Truck-Fed Conveyors

(*Concluded from Page 59*)

dling purposes. This advantage, of course, is important because of the great variety of materials that can be handled by the same containers and the same trucks.

The wide variety of parts to be handled may not readily be apparent from the mere fact that the principal business of the Mansfield plant is in brass valve for plumbing, heating and air conditioning as well as in electric transmission and overhead trolley-line equipment. However, this equipment actually embraces many more types and sizes than would be imagined. More than 6000 separate and distinct items are made for electric power transmission and distribution lines alone. In addition, there is an extensive line of brass valves and specialties, any one of which may include a large number of parts. For example, an overhead automatic switching frog for trolley coach service contains 22 major parts which in turn are made up of some 450 individual pieces.

Producing, fabricating, assembling, shipping and storing involve complicated operations. Production starts with casting of the brass and malleable iron parts in foundry forming part of the plant. Stamped metal parts are made in a large press department. These items are incorporated during assembly with porcelain insulators and bushings which are produced in the company's plants at Niagara Falls, Ont., and Barberton, O.

Brass castings, on being removed from the molds, are put into steel tote boxes which are conveyed by hand on roller conveyor tables through the rough finishing process.

A furnace-charging battery industrial truck serves to move the malleable castings in and out of the annealing furnaces. This truck handles three annealing boxes at a time, the boxes being stacked by means of hoists on skid platforms which give the necessary floor clearance for the truck forks.

Handling of malleable castings through the rough finishing process is by means of steel boxes which are pushed or pulled over roller conveyor tables. For rough finishing of both brass and malleable castings, the layout consists of two parallel rows of these tables side by side with an aisle between used by a transfer table.

For handling through succeeding manufacturing steps, pieces are for the most part contained in skid boxes and in tote boxes on skid platforms. Stamped metal parts are dropped directly into skid boxes at the punch presses.

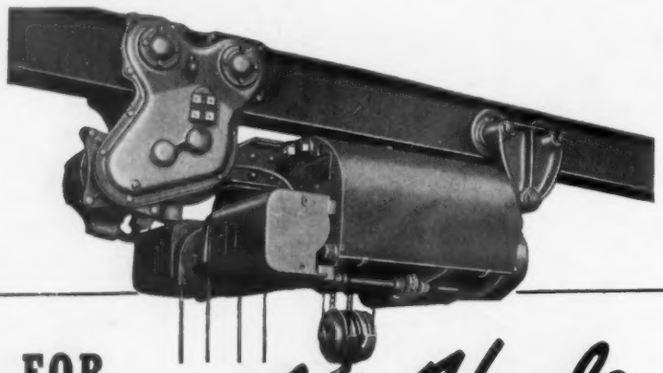
Skid Boxes Handled Singly

Skid boxes have been designed to permit handling one at a time by hand-lift truck or in pairs by battery-elevating platform trucks. Fig. 1 shows a pair of skid boxes being handled by power truck. These happen to be sectional bin-type containers, the sectional sides permitting depth of box to be adjusted to type of material being handled.

Practically all skid boxes are designed with lengths and widths of such dimensions as to permit handling one at a time by hand-lift trucks and in pairs by battery-elevating platform trucks. In this way interchangeability of loads has been obtained and needless handling is avoided at the various junction points between short hand hauls within departments and the longer power hauls between departments.

Chips and turnings in the machine shop are collected into skid-mounted pans designed for pick-up by either hand or power truck.

The original plant occupied a triangular area formed by three intersecting railroads. When growth in the business necessitated expansion



FOR *Long Fast Hauls* use a MOTOR TROLLEY TYPE A-E-CO LO-HED HOIST

When—1. The haul is long, regardless of weight of load. 2. The operation is frequently repeated. 3. The path under hoist is obstructed. 4. Speed is an important factor—

The motor trolley type A-E-CO Lo-Hed Hoist should be used—It is driven by a separate motor and controlled from the floor.

For high-lights of this hoist see A-E-CO POINTS (below). For full details of Lo-Hed hoists, send for our new catalog today.

A-E-CO POINTS

- Lo-Heds range from ¼ to 12 ton capacities (above type available from ½ to 12 tons).
- Operates on Standard I-beam or track of any make.
- Low headroom—stacks materials higher than any other hoist.
- Safe, fool-proof.
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- Protected against dust, moisture, fumes.
- Heavy duty, ball-bearing HOIST MOTOR.
- Automatic lowering brake.
- Ball or roller bearings at vital points.
- Improved plow-steel cable.
- 100% positive automatic stop.
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A-E-CO Lo-Hed HOISTS

AMERICAN ENGINEERING COMPANY

2484 ARAMINGO AVENUE, PHILADELPHIA, PA.

Fig. 4—This railroad underpass, forming a 15 per cent grade for 75 feet, is on one of the industrial truck routes

of the plant beyond, a railroad underpass was built to connect with the original plant. As shown in Fig. 4, this forms a grade of approximately 15 per cent for a distance of some 75 feet. This grade, of course, must be traversed by the power trucks in handling material between plants.

Industrial truck loads range up to about 6000 pounds although the average may be close to 1000. Approximately 75 tons of material are carried per day with hauls ranging up to about 600 feet.

No Specific Routes

Except for the one employed for furnace charging, trucks are not restricted to specified routes. Any truck is able to handle any load destined for any department. Usual practice of the operator on delivering a load is to pick up any return load that happens to be ready. Thus routing of trucks is largely automatic.

The power trucks also provide a plant supply service. For example, gasoline and oil are delivered twice a week to all departments. This is done by means of skid-mounted supply tanks and saves much time formerly spent by workmen going to the supply house for these materials.

Normally the plant operates one shift a day so one battery per truck normally provides adequate power. Charging is done at night, supplemented when necessary by a one-hour charge at noon.

One of the oldest users of battery industrial trucks, this company has supplemented the first one, placed in operation in 1914, by seven others added in later years. Incidentally, the first truck is still in operation after 25 years of continual service. The secret of successful truck operation according to the management lies in proper maintenance of equipment. All trucks are cleaned thoroughly and lubricated at least once a week. A competent mechanic and electrician is on duty at all times to service them.

♦

Tank Lining Material

■ A new synthetic tank lining material has been developed by United States Stoneware Co., Akron, O. It is suitable for handling any or all plating or pickling solutions. Being unaffected by strong oxidizing agents such as concentrated nitric, sulphuric or chromic acids, aqua regia, etc., the lining material allows tanks to hold one solution and then another without compromising solutions. Although generally applied to steel tanks, the lining also may be applied to wood and concrete tanks.

Machine Tool Progress

■ "Since 1872," a 16-page booklet published by W. F. and John Barnes Co., Rockford, Ill., gives an interesting history of machine tools from 1872 to the present day and particularly stresses the necessity for standardization in building special machines. Copies of the booklet are available from the company.

Textbook on Foundry Calculations, Drawings

■ *Foundry Calculations and Drawings*, by Leslie Booth; fabricoid, 133 pages, 5 x 7½ inches; published by J. B. Lippincott Co.; supplied by STEEL, Cleveland, for $1.50.

This book, one of a series of industrial textbooks, is designed to help the practical man, student and apprentice interested or engaged in foundry practice. It is intended to bridge the gap between practice and theory and to that end covers the elementary principles.

The text is supplemented by 71 illustrations and an index. A mild criticism would be on the space devoted to calculating crucible steel charges, since this branch of foundry practice now is practically obsolete. However, the basic principles are the same in calculating any type of metal charge, and for that reason the information may be adapted.

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Capacity Schedules Seen Next Quarter

Orders Apportioned As Mills Seek To Curb Speculation

MARKET IN TABLOID ★

Demand
Strong; some products sold out for rest of year.

Prices
Firm; export quotations up; scrap prices soar.

Production
Rises 5½ points to 79½ per cent

■ STEELMAKING capacity for the remainder of the year rapidly is being absorbed by the continued heavy flow of orders for finished and semifinished products.

All available facilities are being rushed into service, ingot production last week rising 5½ points to 79½ per cent. A year ago the rate was 46 per cent. Additional gains are indicated for coming weeks, but the industry anticipates difficulty in pushing operations much above 90 per cent of theoretical capacity before the end of the year. Large sums are being spent on reconditioning of equipment.

The flood of buying the past three weeks has left some mills confused regarding deliveries. Certain mills will accept no more business in semifinished steel for 1939 delivery; others are sold out until 1940 on sheets and bars. Backlogs of all products have expanded markedly, despite producers' efforts to discourage speculative buying.

A major problem of sellers is the apportionment of output in order to take care of all regular customers. In some cases this has made it necessary to restrict orders to a volume commensurate with the buyer's previous purchases.

Reaffirmation of finished steel prices relieved some of the pressure for immediate delivery but did not moderate consumers' urgency to be assured of future shipment. Demand generally is predicated on the assumption that higher prices are inevitable after Dec. 31.

Export markets continue active, but at the moment mills are concerned principally with handling the crush of domestic business, and no important orders have come from the belligerents. Meanwhile, export prices are stiffening, advances so far this month extending to $15 a ton on semifinished steel and $6 on sheets.

Some sellers have quoted as high as $45 on semi-finished steel for export, but this has not attracted foreign buying. It is understood the British government has withdrawn its recent large inquiry for semi-finished material. The export market on pig iron is at least $2 a ton above the domestic prices. Steel orders from neutrals, particularly South American countries, are expanding, but the total is small in relation to inquiries.

Iron and steel scrap prices still are rising rapidly in the most bullish market since 1917. The scrap composite jumped $2.17 last week to $20, highest since August, 1937, and an increase of nearly 30 per cent since Sept. 1.

Railroads continue active buyers of steel and equipment. Rail orders last week totaled nearly 66,000 tons, the principal item being 50,000 tons for the Pennsylvania. This brought the month's purchases to date in excess of 150,000 tons. Pending business is headed by 100,000 tons for the Union Pacific.

Freight car orders include 2000 for the Norfolk & Western, 1000 for the Erie and 500 for the Wheeling & Lake Erie. Car builders are swamped with inquiries but have been unable to quote on many which might be converted into orders immediately, because of limited facilities both in men and equipment. Among the more active inquiries are 4000 cars for the New York Central, 2000 for the Bessemer & Lake Erie, 1500 each for the Elgin, Joliet & Eastern and Baltimore & Ohio and 500 to 1000 for the Chicago, Rock Island & Pacific.

Tin plate demand, aided by heavy export inquiries, has expanded markedly. Production spurted 12 points last week to 80 per cent, with active mills generally at capacity. Domestic buying accounts for most of the increase and partially reflects low inventories of consumers and expectations of higher prices before the end of the year.

The automobile industry continues an important factor in swelling sheet, strip, bar and wire demand.

Shipbuilding and construction work are furnishing large orders for heavy steel products. Latest awards include 27,600 tons, mostly plates, for six more cargo boats placed by the maritime commission, 3300 tons of shapes for California bridges, 3000 tons of shapes for a New York apartment building and 3438 tons of reinforcing bars for the Los Angeles river channel.

Principal upturn in steelmaking last week was a rise of 11½ points at Chicago to 78½ per cent. Pittsburgh increased 5 points to 75 and Youngstown was up 7 points to 82. Other gains included 2 points to 59 in eastern Pennsylvania, 2 points to 88 at Wheeling, 1 point to 84 at Cleveland, 5 points to 72 at Buffalo, 3 points to 83 at Birmingham, 3½ points to 71½ at Cincinnati, 4½ points to 66½ at St. Louis and 5 points to 80 in New England. Detroit was unchanged at 99.

COMPOSITE MARKET AVERAGES

	Sept. 23	Sept. 16	Sept. 9	One Month Ago Aug., 1939	Three Months Ago June, 1939	One Year Ago Sept., 1938	Five Years Ago Sept., 1934
Iron and Steel	$37.16	$36.76	$36.01	$35.95	$35.69	$36.48	$32.15
Finished Steel	55.60	55.60	55.60	55.60	55.70	57.20	54.00
Steelworks Scrap..	20.00	17.83	15.79	15.30	14.49	14.23	9.45

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Sept. 23, 1939	Aug. 1939	June 1939	Sept. 1938
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.25c
Steel bars, Chicago	2.15	2.15	2.15	2.25
Steel bars, Philadelphia	2.47	2.47	2.47	2.57
Iron bars, Terre Haute, Ind.	2.05	2.05	2.05	2.15
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.00	2.00	2.00	2.15
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.00	2.00	2.00	2.15
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.35
Wire nails, Pittsburgh	2.45	2.40	2.45	2.45

Semifinished Material

Sheet bars, Pittsburgh, Chicago.	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts.	43.00	43.00	43.00	43.00

Pig Iron

	Sept. 23, 1939	Aug. 1939	June 1939	Sept. 1938
Bessemer, del. Pittsburgh	$24.34	$22.34	$22.34	$21.34
Basic, Valley	22.50	20.50	20.50	19.50
Basic, eastern, del. Philadelphia	24.34	22.34	22.34	21.34
No. 2 foundry, Pittsburgh	24.21	22.21	22.21	21.21
No. 2, foundry, Chicago	23.00	21.00	21.00	20.00
Southern No. 2, Birmingham	19.38	17.38	17.38	16.38
Southern No. 2, del. Cincinnati	22.89	20.89	20.89	19.89
No. 2X, del. Phila. (differ. av.)	25.215	23.215	23.215	22.215
Malleable, Valley	23.00	21.00	21.00	20.00
Malleable, Chicago	23.00	21.00	21.00	20.00
Lake Sup., charcoal, del. Chicago	30.34	28.34	28.34	28.34
Gray forge, del. Pittsburgh	23.17	21.17	21.17	20.17
Ferromanganese, del. Pittsburgh	105.33	85.33	85.33	97.77

Scrap

Heavy melting steel, Pittsburgh	$22.25	$16.15	$15.00	$15.25
Heavy melt. steel, No. 2, E. Pa.	18.75	14.375	13.125	12.75
Heavy melting steel, Chicago	17.75	13.75	13.55	13.60
Rails for rolling, Chicago	21.75	17.75	17.75	17.75
Railroad steel specialties, Chicago	20.25	15.50	15.50	16.60

Coke

Connellsville, furnace, ovens	$3.75	$3.75	$3.75	$3.75
Connellsville, foundry, ovens	5.00	5.00	5.00	5.00
Chicago, by-product fdry., del.	10.50	10.50	10.50	10.50

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.00c
Chicago, Gary	2.00c
Cleveland	2.00c
Detroit, del.	2.10c
Buffalo	2.00c
Sparrows Point, Md.	2.00c
New York, del.	2.24c
Philadelphia, del.	2.17c
Granite City, Ill.	2.10c
Middletown, O.	2.00c
Youngstown, O.	2.00c
Birmingham	2.00c
Pacific Coast points	2.50c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast points	3.65c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill.	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast points	4.00c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.50c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.35c	3.95c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	24.00	25.00
Plates	27.00	29.00
Sheets	34.00	36.00
Hot strip	21.50	23.50
Cold strip	28.00	30.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates	21.50	22.00	25.50	30.50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	24.00	35.00
Cold stp.	22.00	22.50	32.00	52.00

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c
Philadelphia, del.	2.15c
Boston, delivered	2.42c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.10c
Sparrows Point, Md.	2.10c
Claymont, Del.	2.10c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast points	2.60c

Steel Floor Plates

Pittsburgh	3.35c
Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	3.95c

Standard Shapes

Pittsburgh	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast points	2.70c

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.80
Granite City, Ill.	4.40

Bars

Soft Steel

(*Base, 20 tons or over*)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast points	2.75c

Rail Steel

(*Base, 15 tons or over*)

Pittsburgh	2.00c
Chicago or Gary	2.00c
Detroit, delivered	2.10c
Cleveland	2.00c

Buffalo	2.00c
Birmingham	2.00c
Gulf ports	2.35c
Pacific Coast points	2.60c

Iron

Chicago, Terre Haute	2.05c
Philadelphia	2.37c
Pittsburgh, refined	3.50-8.00c

Reinforcing

*New Billet Bars, Base**

Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt., Pitts.	1.90c
Gulf ports	2.25c
Pacific Coast ports	2.35c

*Rail Steel Bars, Base**

Pittsburgh, Gary Chicago, Buffalo, Cleveland, Birm.	1.80c
Gulf ports	2.15c
Pacific Coast ports	2.25c

**Base prices 20 cents less per 100 lbs. on billet bars, 15 cents less on rail steel, in lots of 20 tons or over of one size, in lengths of 30 feet or over, for shipment at one time to one destination.*

Wire Products

Pitts-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard wire nails	$2.40
Cement coated nails	$2.40
(Per pound)	
Polished fence staples	2.40c
Galv. barbed wire, standard 12½ gage two-point hog, 80-rod spool $2.76; two-point cattle, 80-rod spool	$2.58
Annealed fence wire	2.90c
Galv. fence wire	3.30c
Woven wire fencing (base C. L. column)	67.00
Single loop bale tie (base C. L. column)	56.00

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago-Birmingham (except spring wire)

Bright bess., basic wire	2.60c
Galvanized wire	2.65c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut Nails

Carload, Pittsburgh $3.70

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

* Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem	2.70c
Detroit, delivered	2.80c

Alloy S.A.E.	Diff.	Alloy S.A.E.	Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.55	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo.	0.55
4600 0.20 to 0.30 Mo. 1.50-2.00 Ni.	1.10
5100 0.80-1.10 Cr.	0.45
5100 Cr. spring flats	0.15
6100 bars	1.20
6100 spring flats	0.85
Cr. N., Van.	1.50
Carbon Van.	0.85
9200 spring flats	0.15
9200 spring rounds, squares	0.40

Electric furnace up 50 cents.

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.00c
Detroit, del.	2.10c
Philadelphia, del.	2.32c
New York, del.	2.36c
Cooperage hoop, Youngs., Pitts.; Chicago, Birm.	2.10c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

Carbon	Cleve., Pitts.
0.26—0.50	2.80c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	2.95c
Detroit, del.	3.05c
Worcester, Mass.	3.95c

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill	$40.00
Relay rails, Pittsburgh 20—100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	$40.00
Do., rerolling quality	39.00

Cents per pound

Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.15c
Car axles forged, Pitts., Chicago, Birmingham	3.15c
Tie plates, base	2.15c

Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade as per Dec. 1, 1932, lists, carloads 5% up; full containers additional 10%.

Carriage and Machine

½ x 6 and smaller	68.5 off
Do. larger, to 1-in.	66 off
Do. 1⅛ and larger	64 off
Tire bolts	52.5 off

Stove Bolts

In packages with nuts attached 72.5 off; in packages with nuts separate 72.5-12½ off; bulk 84 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Step bolts	60 off
Elevator bolts	60 off
Plow bolts	68.5 off

Nuts

Semifinished hex.	U.S.S.	S.A.E.
6-inch and less	67	70
⅞-1-inch	64	65
1⅛ and larger	62	62

Hexagon Cap Screws

Upset, 1-in., smaller....67.5 off

Square Head Set Screws

Upset, 1-in., smaller....75.0 off

Headless set screws ...70.0 off

Piling

Pitts., Chgo., Buffalo	2.40c
Gulf ports	2.75c

Rivets, Washers

Structural, Pittsburgh, Cleveland, Chicago	3.40c
⅞-inch and smaller, 11 and 12	63½ 54
Pitts., Chi., Cleve.	65-10 off
Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off	

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1⅛ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
½	63½	54
¾	66½	58
1—3	68½	60½

Iron

⅜	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½
9 and 10	64½	55

Iron

2	30½	15
2½—3½	31½	17½
4	33½	21
4½—8	32½	20
9—12	28½	15

Line Pipe

Steel

1 to 3, butt weld		67½
2, lap weld		60
2½ to 3, lap weld		63
3½ to 6, lap weld		65
7 and 8, lap weld		64
10-inch lap weld		63½
12-inch, lap weld		62½

Iron

	Blk.	Galv.
¾ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15½
2 butt weld	32½	15
1½ lap weld	23½	7
2 lap weld	25½	9
2½ to 3½ lap weld	26½	11½
4 lap weld	28½	15
4½ to 8 lap weld	27½	14
9 to 12 lap weld	23½	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½"O.D.	13	$ 9.72	$23.71
1¾"O.D.	13	11.06	22.93
2" O.D.	13	12.38	19.35
2¼"O.D.	13	13.79	21.68
2¼"O.D.	12	15.16	....
2½"O.D.	12	16.58	26.57
2¾"O.D.	12	17.54	29.00
3" O.D.	12	18.35	31.36
3½"O.D.	11	23.15	39.81
4" O.D.	10	28.66	49.90
5" O.D.	9	44.25	73.93
6" O.D.	7	68.14	....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1 "O.D.	13	$ 7.82	$ 9.01
1¼"O.D.	13	9.26	10.67
1½"O.D.	13	10.23	11.79
1¾"O.D.	13	11.64	13.42
2" O.D.	13	13.04	15.03
2¼"O.D.	13	14.54	16.76
2½"O.D.	12	16.01	18.45
2½"O.D.	12	17.54	20.21
2¾"O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½"O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½"O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$42.00-43.00
4-in., Birmingham	45.00-46.00
4-in., Chicago	53.80-54.80
6-in. & over, Chicago	50.80-51.80
6-in. & over, east fdy.	46.00
Do., 4-in.	49.00

Class A Pipe $3 over Class B
Stnd. fitgs., Birm., base $100.00

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point	$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00

Forging Quality Billets

Pitts., Chi., Gary, Cleve., Young., Buffalo, Birm.	40.00
Duluth	42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago	34.00
Detroit, delivered	36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅜-inch incl.	43.00
Do., over ⅜ to 41/64-in. incl.	48.00

Worcester up $2; Galveston up $6; Pacific Coast up $9.

Skelp

Pitts., Chi., Youngstown, Coatesville, Sparrows Pt. 1.90c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$3.75
Connellsville, fdry.	4.75- 5.50
Connell. prem. fdry.	5.75- 6.25
New River fdry.	6.50- 6.75
Wise county fdry.	5.50- 5.75
Wise county fur.	4.50- 4.75

By-Product Foundry

Newark, N. J., del.	10.88-11.35
Chi., ov., outside del.	9.75
Chicago, del.	10.50
Terre Haute, del.	10.00
Milwaukee, ovens	10.50
New England, del.	12.50
St. Louis, del.	11.00-11.50
Birmingham, ovens	7.00
Indianapolis, del.	10.00
Cincinnati, del.	9.75
Cleveland, del.	10.30
Buffalo, del.	10.50
Detroit, del.	10.25
Philadelphia, del.	10.65

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	16.00c
Toluol, two degree	22.00c
Solvent naphtha	26.00c
Industrial xylol	26.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (200 lb. drums)	16.25c
Do. (450 lbs)	15.25c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	5.75c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$28.00

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$24.00	$24.50	$23.50	$25.00
Birdsboro, Pa.	24.00	24.50	23.50	25.00
Birmingham, Ala.‡	19.38	....	18.38	24.00
Buffalo	23.00	23.50	22.00	24.00
Chicago	23.00	23.00	22.50	23.50
Cleveland	23.00	23.00	22.50	23.50
Detroit	23.00	23.00	22.50	23.50
Duluth	23.50	23.50	.....	24.00
Erie, Pa.	23.00	23.50	22.50	24.00
Everett, Mass.	24.00	24.50	23.50	25.00
Granite City, Ill.	23.00	23.00	22.50	23.50
Hamilton, O.	23.00	23.00	22.50	.....
Neville Island, Pa.	23.00	23.00	22.50	23.50
Provo, Utah	21.00	.....	.....	.....
Sharpsville, Pa.	23.00	23.00	22.50	23.50
Sparrow's Point, Md.	24.00	.....	23.50	.....
Swedeland, Pa.	24.00	24.50	23.50	25.00
Toledo, O.	23.00	23.00	22.50	23.50
Youngstown, O.	23.00	23.00	22.50	23.50

‡Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	24.39	24.39	23.89	24.89
Baltimore from Birmingham	24.78	.....	23.66	.....
Boston from Birmingham	24.12	.....	.....	.....
Boston from Everett, Mass.	24.50	25.00	24.00	25.50
Boston from Buffalo	24.50	25.00	24.00	25.50
Brooklyn, N. Y., from Bethlehem	26.50	27.00	.....	.....
Canton, O., from Cleveland	24.39	24.39	23.89	24.89
Chicago from Birmingham	†23.22	.....	.....	.....
Cincinnati from Hamilton, O.	23.24	24.11	23.61	.....
Cincinnati from Birmingham	23.06	.....	22.06	.....
Cleveland from Birmingham	23.32	.....	22.82	.....
Mansfield, O., from Toledo, O.	24.94	24.94	24.44	24.44
Milwaukee from Chicago	24.10	24.10	23.60	24.60
Muskegon, Mich., from Chicago, Toledo or Detroit	26.19	26.19	25.69	26.69
Newark, N. J., from Birmingham	25.15	.....	.....	.....
Newark, N. J., from Bethlehem	25.53	26.03	.....	.....
Philadelphia from Birmingham	24.46	.....	23.96	.....
Philadelphia from Swedeland, Pa.	24.84	25.34	24.34	.....
Pittsburgh district from Neville Island	Neville base, plus 69c, 84c, and $1.24 freight.			
Saginaw, Mich., from Detroit	25.45	25.45	24.95	24.95

	No. 2 Fdry.	Malleable	Basic	Bessemer
St. Louis, northern	23.50	23.50	23.00	....
St. Louis from Birmingham	†23.12	....	22.62	....
St. Paul from Duluth	25.63	25.63	....	26.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $28.50, base; $29.74 delivered Philadelphia.

Gray Forge		Charcoal	
Valley furnace	$22.50	Lake Superior fur.	$27.00
Pitts. dist. fur.	22.50	do., del. Chicago	30.34
		Lyles, Tenn.	26.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $27.50; 6.51-7—$28.00; 7-7.50—$28.50; 7.51-8—$29.00; 8-8.50—$29.50; 8.51-9—$30.00; 9-9.50—$30.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	52.50

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

Imported dead - burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Do. domestic	40.00
Do., f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00
Quickset magnesite grains, f.o.b. Chewelah, Wash., net, bulk	22.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$47.00
Chem. bonded chrome	47.00
Magnesite brick	67.00
Chem. bonded magnesite	57.00

Fluorspar

Washed gravel, duty pd., tide, net ton	$24.50
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail	19.00-20.00
Do. barge	19.00-20.00
No. 2 lump	19.00-20.00

Ferroalloy Prices

Ferromanganese, 78-82%, tidewater, duty pd. $100.00
Do., del. Pittsburgh 105.33

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot 32.00
Do., 26-28%, Palmerton 39.50

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 80.50
Do., 75 per cent 126.00
Spot, $5 a ton higher.

Silicomanganese, 2½ c. 103.00
2% carbon, 108.00; 1%, 118.00
Contract ton price $11 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 2.00

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 10.50c
Do., ton lots 11.25c
Do., less-ton lots 11.50c
67-72% carloads, 2% carbon, per lb. contained
chrome 16.50c
Do., ton lots 17.25c
Do., less-ton lots 17.75c

	Carloads	Ton lots	Less ton
2% carb.	16.50c	17.25c	17.50c
1% carb.	17.50c	18.25c	18.50c
0.10% carb.	18.50c	19.25c	19.50c
0.20% carb.	19.50c	20.25c	20.50c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do, less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls $2.25
Do., less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, ti., 6-8% carb., carlots, contr., net ton $142.50
Do, spot 145.00
Do, contract, ton lots 145.00
Do, spot, ton lots 150.00
15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50
Do, spot 160.00
Do, contract, ton lots 160.00
Do, spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c
Do, ton lots 8.00c
Do, less-ton lots 8.50c
Spot ½c lb. higher

Chromium Briquets, contract, any quantity, freight allowed, lb. 7.25c
Do, spot carlots, bulk 7.50c
Do, ton lots 8.00c
Do., less-ton lots 8.25c

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50
Do, smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10
Do, spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 80.00c
Do, spot 85.00c
88% chrome, contract 79.00c
Do, spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.00c
Do., 2% 12.50c
Spot ¼c higher

Silicon Briquets, contract carloads freight allowed, ton $69.50
Carload, spot 74.50
Less-ton lots, lb. 3.75c

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.00c
Ton lots 5.50c
Less-ton lots 5.75c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, gross ton $97.50
Do, spot 102.50
34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60
Do, 100-200 lb. lots 2.75
Do, under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: SAE 2300	Cold Drawn Bars: SAE 3100
Boston	3.88	4.06	5.06	3.85	3.85	5.66	3.71	4.78	4.86	3.46	4.13	8.63	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	3.58	3.51	4.09	8.59	7.19
Philadelphia	3.60	3.60	4.10	3.40	3.40	5.00	3.40	4.55	4.43	3.51	4.06	8.56	7.16
Baltimore	3.70	3.85	3.80	3.55	3.55	5.00	3.55	4.90	5.05	....	4.05	....	....
Norfolk, Va.	3.90	4.00	....	3.75	3.75	5.20	3.75	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	5.25	3.35	4.40	4.40	3.42	3.75	8.15	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.50	3.35	3.65	8.35	6.95
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.55	4.62	3.20	3.75	8.15	6.75
Detroit	3.33	3.43	3.68	3.60	3.65	5.27	3.43	4.50	4.59	3.40	3.80	8.45	7.05
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	....	4.57	3.45	4.00	8.50	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.35	4.30	4.25	3.50	3.75	8.15	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.60	4.95	4.50	3.83	4.34	8.84	7.44
Milwaukee	3.63	3.73	3.73	3.68	3.68	5.28	3.48	4.43	4.38	....	3.88	8.38	6.98
St. Louis	3.62	3.72	3.72	3.47	3.47	5.07	3.38	4.32	4.52	3.61	4.02	8.52	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Memphis	3.90	4.00	4.00	3.95	3.95	5.71	3.75	....	5.00	....	4.31	....	....
Chattanooga	3.80	3.90	3.90	3.85	3.85	5.80	3.65	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.54	4.54	4.33	4.33	5.93	4.24	....	5.19	....	4.69	....	....
Birmingham	3.50	3.60	3.60	3.55	3.55	5.88	3.35	....	4.85	....	4.43	....	....
New Orleans	3.85	4.65	4.65	3.80	3.80	5.75	4.10	....	4.60	5.00	5.10	....	....
Houston, Tex.	3.50	5.85	6.25	4.05	4.05	5.65	3.95	....	5.25	....	....	....	....
Seattle	3.65	3.85	5.20	3.40	3.50	5.25	3.70	6.50	4.75	....	5.60	....	....
Portland, Oreg.	4.00	4.40	6.10	4.00	4.00	5.50	3.95	6.50	4.75	....	5.85	....	....
Los Angeles	4.00	4.50	6.35	4.00	4.00	6.20	4.20	6.30	5.00	4.45	6.00	10.40	9.55
San Francisco	4.00	4.35	6.00	4.00	4.00	5.60	3.75	6.40	5.15	....	6.55	10.65	9.80

	SAE Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	7.50	6.05	5.80	7.90
New York (Met.)	4.04	7.35	5.90	5.65	....
Philadelphia	3.85	7.31	5.86	5.61	7.71
Baltimore	3.85	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.10	5.65	5.40	7.50
Pittsburgh	3.40	7.35	5.95	5.50	7.60
Cleveland	3.30	7.30	5.85	5.85	7.70
Detroit	3.38	7.42	5.97	5.72	7.19
Cincinnati	3.65	7.44	5.99	5.74	7.84
Chicago	3.70	7.10	5.65	5.40	7.50
Twin Cities	3.95	7.45	6.00	6.09	8.19
Milwaukee	3.78	7.33	5.88	5.63	7.73
St. Louis	3.82	7.47	6.02	5.77	7.87
Seattle	5.65	....	7.80	7.65	8.45
Portland, Oreg.	5.70	....	7.80	7.65	8.50
Los Angeles	4.65	9.40	8.55	8.40	9.05
San Francisco	5.00	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds, except 0-1999 pounds (hot rolled sheets only) in New York; 300-1999 pounds in Los Angeles; 0-299 pounds (hoops only) in San Francisco; 300-4999 pounds in Portland, Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York and St. Louis; 450-3749 pounds in Boston; 500-1499 pounds in Buffalo; 1000-1999 pounds in Philadelphia; 300-4999 pounds in San Francisco and Portland; any quantity in Twin Cities.

Galvanized Sheets: Base, 0-1499 pounds in New York, Tulsa; 150-1499 pounds in Cleveland, Pittsburgh; 1-9 bundles in Baltimore, Norfolk; 1-6 bundles in Los Angeles; 300-4999 pounds in Portland, Seattle, San Francisco; 450-3749 pounds in Boston; 500-1499 pounds in Birmingham, Chicago, Cincinnati, Detroit, St. Louis; 1500 pounds and over in Chattanooga, Philadelphia; any quantity in Twin Cities.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1000 pounds and over, except 0-299 pounds in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999 pounds in San Francisco; 0-1999 in Portland.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, Sept. 21

Export Prices f. o. b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports £ s d	Quoted in dollars at current value	Continental Channe or North Sea ports, gross tons **Quoted in gold pounds sterling £ s d
Foundry, 2.50-3.00 Si.	$20.09 5 2 6	$18.32	2 3
Basic bessemer	....	19.59	2 6 0
Hematite, Phos. .03-.05	20.58 5 5 0*	.....	.....
Billets	$28.81 7 7 6	$38.34	4 10 0
Wire rods, No. 5 gage	44.50 11 7 6	43.67	5 2 6
Standard rails	$37.24 9 10 0	$48.99	5 15 0
Merchant bars	1.92c 11 0 0	1.81c to 1.90c	4 15 0 to 5 0 0
Structural shapes	1.75c 10 0 0	1.76c to 1.81c	4 12 6 to 4 15 0
Plates, †¼ in. or 5 mm.	1.91c 10 18 9	2.14c to 2.33c	5 12 6 to 6 2 6
Sheets, black, 24 gage or 0.5 mm.	2.27c 13 0 0	2.90c	7 12 6*
Sheets, gal., 24 ga., corr.	2.75c 15 15 0	3.47c	9 2 6
Bands and strips	2.14c 12 5 0	1.90c to 1.92c	5 0 0 to 5 1 0
Plain wire, base	3.41c 19 10 0	2.33c to 2.66c	6 2 6 to 7 0 0
Galvanized wire, base	4.06c 23 5 0	2.99c	7 17 6
Wire nails, base	....	2.66c to 2.76c	7 0 0 to 7 5 0
Tin plate, box 108 lbs.	$ 3.96 1 0 3	.....	.....

British ferromanganese $100.00 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reich §§Mark	
Fdy. pig iron, Si. 2.5	$19.40	4 19 0(a)	$15.07	679.30	$18.81	550	$25.20	63
Basic bess. pig iron	18.13	4 12 6(a)	.....	....	.....	...	27.80 (b)	69.50
Furnace coke	4.50	1 4 2	4.99	225	6.91	202	7.60	19
Billets	28.71	7 7 6	22.84	1,029	29.41	860	38.60	96.50
Standard rails	1.66c	9 10 0	1.41c	1,405	2.20c	1,375	2.38c	132
Merchant bars	2.03c	11 12 0††	1.32c	1,304	1.76c	1,100	1.98c	110
Structural shapes	1.81c	10 8 0††	1.27c	1,268	1.76c	1,100	1.93c	107
Plates, †¼-in. or 5 mm.	1.91c	10 19 3††	1.66c	1,650	2.20c	1,375	2.29c	127
Sheets, black	2.58c	14 15 0§	1.95c	1,958‡	2.52c	1,575‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.01c	17 5 0	2.86c	2,850	4.32c	2,700	6.66c	370
Plain wire	3.41c	19 10 0	1.98c	2,000	2.64c	1,650	3.11c	173
Bands and strips	2.16c	12 7 0††	1.45c	1,444	2.08c	1,300	2.29c	127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. *Close annealed. ††Rebate of 15s on certain conditions.

**Gold pound sterling not quoted. §§Last prices, no current quotations.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1	†12.00
Bos. dock No. 1 exp.	14.50-15.00
New Eng. del. No. 1	15.00-15.50
Buffalo, No. 1	19.50-20.00
Buffalo, No. 2	18.00-18.50
Chicago, No. 1	17.50-18.00
Chicago, auto, no alloy	16.50-17.00
Chicago, No. 2 auto	14.50-15.00
Cincinnati, dealers	13.50-14.00
Cleveland, No. 1	14.50-15.00
Cleveland, No. 2	13.50-14.00
Detroit, No. 1	14.00-14.50
Detroit, No. 2	13.00-13.50
Eastern Pa., No. 1	20.00-20.50
Eastern Pa., No. 2	18.50-19.00
Federal, Ill.	15.00-15.50
Granite City, R. R.	15.50-16.00
Granite City, No. 2	15.00-15.50
Los Angeles, No. 1	12.50-13.00
Los Angeles, No. 2	11.50-12.00
L. A., No. 1 f.a.s.	15.00-16.00
L. A., No. 2 f.a.s.	14.00-15.00
N. Y. dock No. 1 exp.	14.00
Pitts., No. 1 (R. R.)	23.00-23.50
Pittsburgh, No. 1	22.00-22.50
Pittsburgh, No. 2	20.00-20.50
St. Louis, R. R.	15.50-16.00
St. Louis, No. 2	15.00-15.50
San Francisco, No. 1	12.50-13.00
San Francisco No. 2	11.50-12.00
Seattle, No. 1	11.00-12.00
Toronto, dirs. No. 1	9.25- 9.75
Valleys, No. 1	15.00-15.50

COMPRESSED SHEETS

Chicago, factory	17.00-17.50
Chicago, dealers	15.50-16.00
Cincinnati, dealers	13.00-13.50
Cleveland	14.00-14.50
Detroit	15.50-16.00
E. Pa., new mat.	20.00-21.00
E. Pa., old mat.	17.00
Los Angeles	11.00-11.50
Pittsburgh	22.00-22.50
St. Louis	11.00-11.50
San Francisco	11.00-11.50
Valleys	15.50-16.00

BUNDLED SHEETS

Buffalo, No. 1	18.00-18.50
Buffalo, No. 2	15.00-15.50
Cleveland	11.75-12.25
Los Angeles	14.00
Pittsburgh	20.00-20.50
St. Louis	10.00-10.50
Toronto, dealers	8.00- 8.50

SHEET CLIPPINGS, LOOSE

Chicago	13.00-13.50
Cincinnati, dealers	9.00- 9.50
Detroit	11.50-12.00
†Los Angeles	3.75- 4.00
St. Louis	9.00- 9.50
Toronto, dealers	4.25- 4.75

BUSHELING

Buffalo, No. 1	18.00-18.50
Chicago, No. 1	16.50-17.00
Cincin., No. 1, deal.	8.00- 8.50
Cincinnati, No. 2	4.00- 4.50
Cleveland, No. 2	9.00- 9.50
Detroit, No. 1, new	14.00-14.50
Valleys, new, No. 1	14.75-15.25
Toronto, dealers	3.75- 4.25

MACHINE TURNINGS (Long)

Birmingham	†4.50- 5.00
Buffalo	11.00-11.50
Chicago	10.50-11.00
Cincinnati, dealers	6.50- 7.00
Cleveland, no alloy	7.50- 8.00
Detroit	8.00- 8.50
Eastern Pa.	13.50
Los Angeles	5.00
New York	†6.50- 7.00
Pittsburgh	14.00-14.50
St. Louis	5.50- 6.00
San Francisco	5.00
Toronto, dealers	4.25- 4.75
Valleys	9.50-10.00

SHOVELING TURNINGS

Buffalo	12.00-12.50
Cleveland	9.50-10.00
Chicago	12.00-12.50
Chicago, spcl. anal.	9.00- 9.50
Detroit	10.00-10.50
Pitts., alloy-free	16.00-16.50

BORINGS AND TURNINGS

For Blast Furnace Use

Boston district	3.50
Buffalo	10.50-11.00
Cincinnati, dealers	5.00- 5.50
Cleveland	8.00- 9.50
Eastern Pa.	10.50-11.00
Detroit	8.00- 8.50
New York	†3.50- 4.00
Pittsburgh	11.00-11.50
Toronto, dealers	3.50- 4.00

AXLE TURNINGS

Buffalo	13.50-14.00
Boston district	†8.50- 9.00
Chicago, elec. fur.	19.00-19.50
East. Pa. elec. fur.	17.50-18.00
St. Louis	10.00-10.50
Toronto	4.00- 4.25

CAST IRON BORINGS

Birmingham	†6.00- 6.50
Boston dist. chem.	†4.75
Buffalo	10.50-11.00
Chicago	11.00-11.50
Cincinnati, dealers	5.00- 5.50
Cleveland	9.00- 9.50
Detroit	8.50- 9.00
E. Pa., chemical	10.00-11.00
New York	†3.50- 4.00
St. Louis	5.00- 5.50
Toronto, dealers	3.75- 4.25

RAILROAD SPECIALTIES

Chicago	20.00-20.50

ANGLE BARS—STEEL

Chicago	20.50-21.00
St. Louis	16.00-16.50

SPRINGS

Buffalo	20.00-20.50
Chicago, coil	22.00-22.50
Chicago, leaf	20.50-21.00
Eastern Pa.	23.50
Pittsburgh	27.00-27.50
St. Louis	18.50-19.00

STEEL RAILS, SHORT

Birmingham	†12.00-12.50
Buffalo	21.00-21.50
Chicago (3 ft.)	20.50-21.00
Chicago (2 ft.)	22.00-22.50
Cincinnati, dealers	20.50-21.00
Detroit	20.00-20.50
Los Angeles	15.00-15.50
Pitts., 3 ft. and less	27.00-27.50
St. Louis, 2 ft. & less	17.00-17.50

STEEL RAILS, SCRAP

Boston district	†13.50-14.00
Buffalo	19.50-20.00
Chicago	18.00-18.50
Cleveland	20.00-20.50
Pittsburgh	25.00-25.50
St. Louis	16.00-16.50
Seattle	16.00

FROGS, SWITCHES

Chicago	17.50-18.00
St. Louis, cut	16.00-16.50

ARCH BARS, TRANSOMS

St. Louis	15.50-16.00

PIPE AND FLUES

Chicago, net	14.00-14.50
Cincinnati, dealers	9.00- 9.50

RAILROAD GRATE BARS

Buffalo	12.00-12.50
Chicago, net	11.50-12.00
Cincinnati, dealers	8.75- 9.25
Eastern Pa.	22.50
New York	†10.50
St. Louis	10.00-10.50

RAILROAD WROUGHT

Birmingham	†11.00-11.50
Boston district	†9.50-10.00
Eastern Pa., No. 1	20.00-21.00
St. Louis, No. 1	11.00-11.50
St. Louis, No. 2	15.50-16.00

FORGE FLASHINGS

Boston district	†9.25- 9.75
Buffalo	18.00-18.50
Cleveland	14.75-15.25
Detroit	13.00-13.50
Los Angeles	9.00
Pittsburgh	19.50-20.00

FORGE SCRAP

Boston district	†6.50
Chicago, heavy	20.50-21.00

LOW PHOSPHORUS

Cleveland, crops	17.50-18.00
Eastern Pa., crops	24.00-25.00
Pitts., billet, bloom, slab crops	28.00-28.50

LOW PHOS. PUNCHINGS

Buffalo	20.00-20.50
Chicago	21.00-21.50
Cleveland	16.50-17.00
Eastern Pa.	19.00-20.00
Pittsburgh	23.50-24.00
Seattle	15.00
Detroit	16.00-16.50

RAILS FOR ROLLING

5 feet and over

Birmingham	†14.00-15.00
Boston	15.00-15.50
Chicago	21.50-22.00
New York	†15.00-15.50
Eastern Pa.	22.50
St. Louis	19.50-20.00

STEEL CAR AXLES

Birmingham	†15.00-16.00
Boston district	†14.50
Chicago, net	21.00-21.50
Eastern Pa.	23.00
St. Louis	19.50-20.00

LOCOMOTIVE TIRES

Chicago (cut)	20.00-20.50
St. Louis, No. 1	14.00-14.50

SHAFTING

Boston district	†16.00-16.50
New York	†17.00
Eastern Pa.	24.00
St. Louis, 1¼-3¾".	16.50-17.00

CAR WHEELS

Birmingham	†13.50-14.00
Boston dist., iron	†10.00
Buffalo, steel	20.00-20.50
Chicago, iron	18.00-18.50
Chicago, rolled steel	20.00-20.50
Cincin., iron, deal.	15.50-16.00
Eastern Pa., iron	21.00
Eastern Pa., steel	23.50
Pittsburgh, iron	21.00-21.50
Pittsburgh, steel	27.00-27.50
St. Louis, iron	17.00-17.50
St. Louis, steel	18.00-18.50

NO. 1 CAST SCRAP

Birmingham	†13.00-13.50
Boston, No. 1 mach.	†11.50-11.75
N. Eng. del. No. 2	14.50-15.00
N. Eng. del. textile	14.50-15.00
Buffalo, cupola	19.00-19.50
Buffalo, mach.	20.00-20.50
Chicago, agri. net	15.00-15.50
Chicago, auto net	16.00-16.50
Chicago, railroad net	16.00-16.50
Chicago, mach. net	16.50-17.00
Cincin., mach. deal.	15.50-16.00
Cleveland, mach.	19.00-19.50
Detroit, cupola, net	14.50-15.00
Eastern Pa., cupola	23.00
E. Pa., mixed yard	16.00
Los Angeles, net	13.00-13.50
Pittsburgh cupola	22.00-22.50
San Francisco, del.	12.50-13.00
Seattle	13.50-14.50
St. Louis, cupola	13.50-14.00
St. Louis, agri. mach.	15.00-15.50
St. L., No. 1 mach.	15.25-15.75
San Francisco	12.50-13.00
Toronto, No. 1, mach., net	12.00-12.50

HEAVY CAST

Boston dist. Break.	†11.25-11.75
New England, del.	14.50-15.00
Buffalo, break.	15.50-16.00
Cleveland, break, net	13.00-13.50
Detroit, auto net	14.50-15.00
Detroit, break.	12.50-13.00
Eastern Pa.	20.00
Los Ang., auto, net.	13.50
New York, break.	†13.00-13.50
Pittsburgh, break	19.00-19.50

STOVE PLATE

Birmingham	†7.50- 8.00
Boston district	†8.00- 8.25
Buffalo	15.00-15.50
Chicago, net	12.00-12.50
Cincinnati, dealers	8.75- 9.25
Detroit, net	8.50- 9.00
Eastern Pa.	17.00
New York, fdy.	†10.00-10.50
St. Louis	10.00-10.50
Toronto dealers, net	6.50- 7.00

MALLEABLE

Birmingham, R. R.	†10.50-11.00
New England, del.	11.50-12.50
Buffalo	20.00-20.50
Chicago, R. R.	21.00-21.50
Cincin., agri., deal.	13.00-13.50
Cleveland, rail	19.25-19.50
Eastern Pa., R. R.	20.00-21.00
Los Angeles	15.00
Pittsburgh, rail	22.00-22.50
St. Louis, R. R.	16.00-16.50

Iron Ore

Lake Superior Ore

Gross ton, 51½ %

Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbessemer	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbessemer	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56.63% con.	9.00-9.25
Cop.-free low phos. 58-60%	nominal

Foreign Ore

Cents per unit, c.i.f. Atlantic

Foreign manganiferous ore, 45.55% iron, 6-10% man.	nom.
No. Afr. low phos.	nom.
Swedish low phos.	nom.
Spanish No. Africa basic, 50 to 60% nom.	nom.
Tungsten, short ton unit, duty pd. nom.	$23.75
N. F., fdy., 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	$23.00-24.00
Molybdenum ores sulphide, per lb. molybdenum contained, f.o.b. mill	0.75

Manganese Ore

Prices not including duty, cents per unit cargo lots.

Caucasian, 50-52% nominal	50.00
So. African, 50-52% nominal	50.00
Indian, 49-50%	nom.

Sheets, Strip

Sheet & Strip Prices, Pages 170, 171

Pittsburgh—Sheet and strip mills here are rapidly approaching peak production. Some producers are reported to be booked solid for the remainder of the year, although this does not take into consideration some hand mill capacity which may be brought into service to alleviate the jam. Mills are attempting to apportion tonnage in order not to penalize buyers who were slow to place orders.

Cleveland—Efforts to speed sheet and strip production have been without effect on backlogs which in some cases are approaching probable output through the remainder of the year. Heavy bookings since reaffirmation of prices indicate consumers are highly concerned regarding deliveries.

Chicago—Efforts are being made to increase production as much as possible. Possibility is seen that some rolling equipment long idle will be readied for use. Galvanized sheets in particular have been in demand lately, partly because higher zinc prices point to an advance in coated material.

Boston—Cold strip mills are heavily booked, with finishing operations up substantially. Reaffirmation of prices has caused some letdown in pressure to cover. Nevertheless, considerable volume has been taken to insure shipments well into next quarter. Sheet buying holds well, but consumers are less concerned as to deliveries and prices.

New York—Sheet prices on export business have increased an additional $3 a ton. This brings the market to the equivalent of 3.05c, f.a.s., for 24 gage black sheets, an increase of about $6 a ton since start of the European war.

Philadelphia—Consumers still are active in attempting to obtain preferred positions on books, with an increasing tonnage being placed at unnamed prices where deliveries fall into next year, as in the case of cold-rolled sheets. Hot-rolled sheet deliveries are not so extended, some eastern mills being able to ship some tonnage in six to eight weeks. Galvanized deliveries in most cases are far extended.

Buffalo — Mills are pressed with sheet and strip orders beyond their productive ability. A large portion of current business is made up of releases against old orders, with some of new buying speculative. Motor manufacturers and partsmakers are calling for larger lots which is delaying shipments to smaller consumers.

Cincinnati—Producers have turned down some orders in order to be in a position to take care of regular customers. One mill is accepting additional tonnage for fourth quarter delivery only in electrical sheets and stainless, being sold out on other grades. Some buyers are seeking position on order books for first quarter delivery, prices to be those in effect at that time.

St. Louis—Sheet orders and shipments have expanded markedly. Production has been raised to the highest level in many months. Miscellaneous demand still predominates, but automotive releases are improved and takings by equipment makers are larger.

Birmingham, Ala.—While hardly up to expectations, sheets remain in steady demand, especially roofing, and there is reason to believe some improvement in that specification is in prospect. Manufacturers' sheets and cotton ties also are in satisfactory volume.

Plates

Plate Prices, Page 170

Boston — Miscellaneous demand holds recent moderate gains, with specifications against shipbuilding requirements well maintained. Prices are firmer. Industrial demand has improved, including some tonnage for pulp and paper mills, although oil tank requirements are light.

New York — Specifications are brisk, and although last week it was still possible for buyers in urgent need to get deliveries within two weeks or so, it is likely that shipments soon will be deferred rather materially. Export prices on plates are stronger at about 2.15c, f.a.s. for tank plates and 2.30c for ship material.

Philadelphia — Plates can still be shipped within a fortnight by most eastern producers, although mounting backlogs indicate deliveries will be pushed back considerably before long. About 27,600 tons of steel, mostly plates, will be required for six C-2 boats awarded Sun Shipbuilding & Dry Dock Co. by the maritime commission.

Birmingham, Ala. — Plate bookings, due largely to Texas oil tank business, are somewhat above general expectations. Indications are that a large volume will come here as a result of contracts for shipbuilding to Ingalls Shipbuilding Corp.

Seattle—Fabricating shops report more active inquiry for projects involving less than 100 tons. Seattle Boiler Works has taken about 100 tons for stacks for a veneer plant at Springfield, Oreg., and other projects. Beall Pipe & Tank Co., Portland, Oreg., is low at $10,955 on 3500 feet of 24-inch steel pipe, 125 tons, for Bremerton, Wash. Tacoma opened bids Sept. 25 for 500 tons of 30-inch enameled steel pipe.

San Francisco—Plate awards were the second largest for any week in the history of the Pacific Coast, aggregating 26,821 tons. This brought the total to date to 76,985 tons as compared with 25,272 tons for the corresponding period in 1938. Western Pipe & Steel Co., San Francisco and Seattle-Tacoma Shipbuilding Corp., Seattle, were each awarded five C-1 type cargo vessels for the United States maritime commission involving 13,250 tons of plates, 3975 tons of shapes, 575 tons of rivets and over 875 tons of pipe and boiler tubing.

Plate Contracts Placed

13,250 tons, five C-1 type cargo vessels for United States maritime commission, to Seattle-Tacoma Shipbuilding Corp., Seattle.

Plate Contracts Pending

500 tons, 30-inch enameled steel pipe; bids at Tacoma, Wash., Sept. 25.

125 tons, 24-inch water pipe for Bremerton, Wash.; Beall Pipe & Tank Co., Portland, low.

Bars

Bar Prices, Page 170

Pittsburgh — Bar mills are swamped with orders, most operating at capacity. Heaviest buyer is the automotive industry, which has released large lots in many classifications. Backlogs of cold-finished and alloy material are relatively as high as in carbon bars. Nonintegrated mills in some cases are finding it difficult to cover raw steel needs for orders already booked, but this condition is not expected to be permanent. Mills are cautious in taking export orders until domestic schedules are clarified.

Cleveland — The flood of buying abated little last week, and bar mills gradually are becoming sold out for the remainder of the year. Demand is widespread, and some buyers are shopping around in seeking protection on deliveries. Producers are attempting to quell speculative buying by restricting tonnages to average quantities taken by customers in the past.

Philadelphia—Cold drawn bar consumers are increasing their specifications in an effort to avoid penalties of new quantity extras which become generally effective soon. Buying of other grades of bars continues heavy.

Boston—Specifications for hot-roll-

ed and alloy bars continue substantial, buyers pressing for shipment. New buying, however, is less active. Reaffirming of prices halted some business which might have been placed in anticipation of higher fourth quarter quotations.

Birmingham, Ala.—Particular activity has developed in bars, especially concrete reinforcing bars, although mill interests here describe demand for merchant bars as considerably heavier.

Buffalo—Production is around 80 per cent as consumers continue to call for large tonnages. Railroad car shops, motor accessory manufacturers and toolmakers are taking increased lots, and warehouses also are heavier buyers in an attempt to increase stocks before new quantity extras become effective.

Wire

Wire Prices, Page 171

Pittsburgh — Sales of wire and wire products have increased substantially. Coverage has been the principal consideration of buyers, there being no question regarding prices. Some attempts at speculative buying of merchant products have been precluded by allocation of tonnage. Domestic demand accounts for most business, although export inquiry is active, particularly in merchant products.

Cleveland — Wire producers are faced with heavy schedules the remainder of the year as a consequence of the large volume of domestic business already entered and current and prospective export orders. Distributors of merchant products, which are not subject to quarterly price announcements as in the case of manufacturers' wire, have been seeking forward coverage, but mills are discouraging speculative buying. The automotive and bolt and nut industries are contributing to good activity in manufacturers' wire.

Boston—Buying continues brisk, and district mills have substantial backlogs, resulting in higher finishing operations. Demand is well diversified, but manufacturers wire is especially active, from a wide range of consumers. Reaffirming of last quarter prices has resulted in some lessening of pressure for coverage.

Birmingham, Ala.—Wire products are moving in volume in all classifications. Most of the demand is for consumer use. Not a great deal of restocking is in evidence.

Cold-Finished Steel

Cold Finished Prices, Page 171

Base prices of cold-finished carbon steel bars have been reaffirmed until further notice. Quantity extras have been revised, however, resulting in higher net prices on certain quantities. The base quotation of $2.65 per 100 pounds, Pittsburgh, Cleveland, Chicago, Gary and Buffalo and $2.70, Detroit, now applies on lots of 20,000 to 39,999 pounds. Formerly the base quantity was 10,000 to 19,999 pounds.

Quantity extras of $3 per 100 pounds on lots of less than 300 pounds, $2.25 on 300 to 499 pounds and $1.50 on 500 to 999 pounds are unchanged, but increases of 10 cents per 100 pounds are effective on larger quantities. Such new extras follow: $1.10 on 1000 to 1499 pounds; 70 cents on 1500 to 1999 pounds; 50 cents on 2000 to 3999 pounds; 30 cents on 4000 to 5999 pounds; 20 cents on 6000 to 9999 pounds; and 10 cents on 10,000 to 19,999 pounds. Orders above the maximum base quantity of 39,999 pounds take a deduction of 5 cents per 100 pounds. Formerly the deduction for this quantity was 10 cents.

Pipe

Pipe Prices, Page 171

Boston — While cast pipe buying has declined, merchant steel pipe demand has gained slightly, sales through resellers in small lots being more numerous at steadier prices. Releases of cast pipe continue substantial.

New York—Merchant pipe orders are reaching a seasonal peak, as plumbing and heating specifications are being released before cold weather. Resale prices are the strongest here in many months, while mill prices remain steady, with no early increases expected.

Birmingham, Ala.—Some disappointment is expressed over the total volume of bookings, but operations are on a five day basis and the aggregate of small orders is satisfactory.

Seattle — Demand for cast pipe seems more active, most inquiries for small tonnages. Bids are in at Seattle for 600 tons of miscellaneous sizes and Tacoma received tenders Sept. 25 for 200 tons of 18-inch. Hugh G. Purcell, for U. S. Pipe & Foundry Co., Burlington, N. J., has been awarded 100 tons for Columbia City, Oreg., and 45 tons for Marysville, Wash.

Cast Pipe Placed

614 tons, 6 to 10-inch, Burbank, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

408 tons, 4 to 10-inch, Fresno, Calif., to American Cast Iron Pipe Co., Birmingham, Ala.

Cast Pipe Pending

266 tons, 4 to 24-inch, Whittier, Calif.; bids opened.

190 tons, 4 to 12-inch, Sacramento, Calif.; bids opened.

100 tons, 6 and 8-inch, Newport Beach, Calif.; bids Oct. 2.

Rails, Cars

Track Material Prices, Page 171

Continued activity is shown by railroads, placing rails and rolling stock in anticipation of 1940 programs to assure position on mills books. Last week approximately 66,000 tons of rails were awarded and inquiry for 100,000 tons by Union Pacific promises further large bookings. The Pennsylvania led with 50,000 tons and the Nickel Plate and Pere Marquette placed 11,000 tons.

Wheeling & Lake Erie awarded 500 cars and Norfolk & Western 2000. New York Central is inquiring for 4000 cars and about 4000 are out for bids by other lines. Delaware, Lackawanna & Western, noted last week as rebuilding 300 coal cars in its own shops at Scranton, Pa., has increased this to 600 cars to meet expected increase in coal traffic.

Rail Orders Placed

Bureau of reclamation, 3422 tons, to Colorado Fuel & Iron Co., Denver, Colo.

Gulf, Mobile & Northern, 1420 tons rails and 200 tons accessories, to Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

Nickel Plate, 7000 tons 112-pound rails; 4550 tons to Carnegie-Illinois Steel Corp., Pittsburgh, 1250 tons to Inland Steel Co., Chicago, 1200 tons to Bethlehem Steel Co., Bethlehem, Pa.

Pere Marquette, 3000 tons 112-pound rails for lines in United States, 1000 tons 105-pound for Canadian lines; 1410 tons to Carnegie-Illinois Steel Corp., Pittsburgh, 1110 tons to Inland Steel Co., Chicago, 480 tons to Bethlehem Steel Co., Bethlehem, Pa.; 1000 tons to Algoma Steel Corp., Sault Ste. Marie, Ont.

Pennsylvania, 50,000 tons; 25,000 tons to Carnegie-Illinois Steel Corp., Pittsburgh, 22,000 tons to Bethlehem Steel Co., Bethlehem, Pa., and 3000 tons to Inland Steel Co., Chicago.

Locomotives Placed

Boston & Maine, one 4-8-2 type freight locomotive, to Baldwin Locomotive Works, in addition to two ordered previously.

Detroit, Toledo & Ironton, two locomotives, to Lima Locomotive Works, Lima, O.

Car Orders Placed

Delaware & Hudson, 1000 fifty-ton hopper cars; 500 to American Car & Foundry Co., New York, 500 to Beth-

lehem Steel Co., Bethlehem, Pa.

Norfolk & Western, 2000 cars; 750 to Virginia Bridge Co., Roanoke, Va.; 750 to Ralston Steel Car Co., Columbus, O.; 500 to Bethlehem Steel Co., Bethlehem, Pa.

Wheeling & Lake Erie, 500 cars; 400 to Pullman-Standard Car Mfg. Co., Chicago; 100 to Ralston Steel Car Co., Columbus, O.

Locomotives Pending

Erie, seven diesel-electric switchers; three 1000-horsepower, four 600-horsepower.

Rail Orders Pending

Union Pacific, 100,000 tons; scheduled for early distribution.

Car Orders Pending

Baltimore & Ohio, 1000 50-ton gondolas, 500 50-ton box cars.

Bessemer & Lake Erie, 1000 ninety-ton hoppers, 500 fifty-ton gondolas, 500 fifty-ton box cars; bids asked.

Chicago, Rock Island & Pacific, 500 to 1000 fifty-ton box cars; bids asked.

Detroit, Toledo & Ironton, 15 to 25 covered hoppers, 70-ton capacity; bids asked.

Elgin, Joliet & Eastern, 1000 hoppers, 500 gondolas; bids asked.

New York Central, 3500 fifty-five ton steel hopper cars and 500 fifty-five ton box cars, involving an outlay of approximately $10,000,000; pending.

Youngstown & Northern, 100 gondolas.

Union, 100 dump cars.

Buses Booked

American Car & Foundry Motors Co., New York; nine 36-passenger for Harrisburg Railways Co., Harrisburg, Pa.; eight 41-passenger for Triboro Coach Corp., Astoria, L. I.; eight 36-passenger for Worcester Street Railway Co., Worcester, Mass.; six 36-passenger for Georgia Power Co., Atlanta, Ga.; five 32-passenger for Middlesex & Boston Street Railway Co., Waltham, Mass.

Twin Coach Co., Kent, O.: Six 41-passenger and four 31-passenger for Omaha & Council Bluffs Street Railway Co., Omaha, Nebr.; ten 35-passenger for Trenton Transit Co., Trenton, N. J.; eight 25-passenger for Mill Power Supply Co., Charlotte, N. C.; three 37-passenger and three 25-passenger for Pacific Gas & Electric Co., Sacramento, Calif.

Asks Manganese Ore Bids

Washington — Treasury procurement division has asked bids Oct. 19 for a large tonnage of manganese ore under the strategic minerals act. Bids will be taken on 5000 to 40,000 gross tons for delivery at each of several points. Total will not be determined until bids show what quantity can be purchased for the various deliveries at the most advantageous prices.

Weighs 10,500 Pounds

■ Correct weight for Caterpillar 32-horsepower motor grader, pictured in STEEL, Aug. 21, page 20, is 10,500 pounds, not "slightly more than half a ton" as reported.

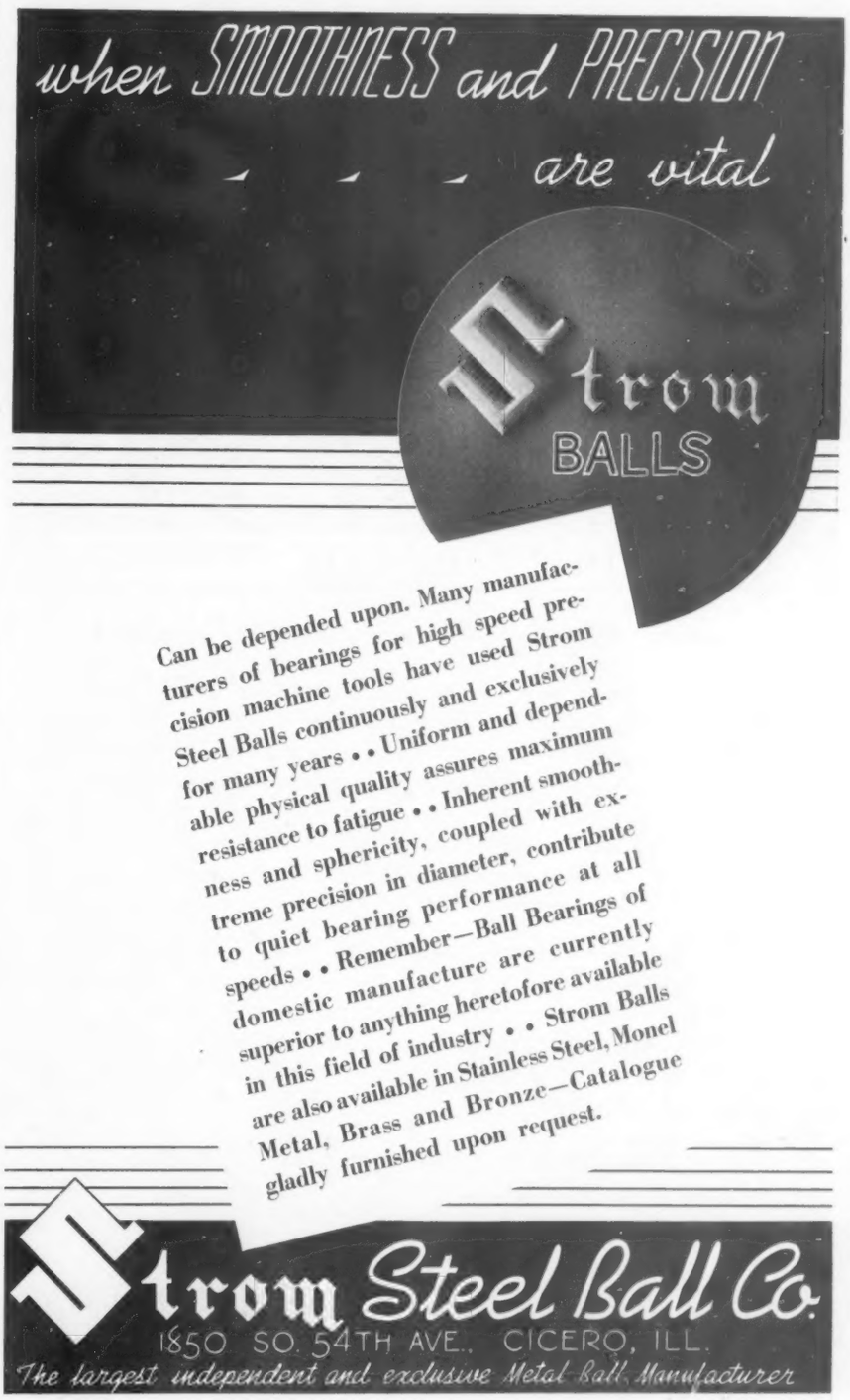
Shapes

Structural Shape Prices, Page 170

Pittsburgh — Construction work continues active, with fabricated shape inquiries and awards steady. Demand is well balanced between public and private projects. Inquiries from private sources indicate considerable industrial expansion.

Chicago—Fabricators report continued quiet in business, both awards and inquiries being light, particularly in this district. However, better demand is expected this fall. Inquiries for plain material are relatively heavy, these being principally for shapes intended for stock.

Seattle — Considerable new business has developed although the week's lettings were below normal. Standard Steel Fabricating Co. & Boiler Works, Seattle, has taken about 300 tons in miscellaneous jobs. Poole & McGonigle, Portland, Oreg., will furnish 115 tons for a ski run at Sun Valley, Idaho. Denver will open bids Sept. 29 for 18 gates and 15 hoists for the Roza project, Wash-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ington state, also gates and hoists for the Dry Creek dam, Colorado, and the All American project, tonnages unstated.

San Francisco—Structural shape awards were the largest for any week of the year, 14,245 tons. This brought the year's aggregate to 112,071 tons, compared with 102,604 tons for the same period last year. Columbia Steel Co. took 2228 tons for the Salt Creek bridge and Bethlehem Steel Co. 1425 tons for the O'Brien Creek bridge, both on the Central Valley project, Calif. Consolidated Steel Corp booked 240 tons for an experimental building at Burbank, Calif., for Lockheed Aircraft Corp.

Boston—Structural steel contracts are dwindling, with new inquiry light. An addition to the Narragansett Electric Co. power plant, Providence, R. I. is outstanding. United Engineers & Constructors, Inc., Philadelphia, will place this business. Bridge work continues to be limited to small spans, approximating 700 tons. Plain material prices are firmer, shading having largely disappeared.

St. Louis—Interest in structurals centers on resumption of highway work in Illinois. Bids close Sept. 26 on work requiring 500 tons. Backlogs are off, and fabricators shape commitments are largely for actual needs.

Shape Contracts Placed

3975 tons, five C-1 type cargo vessels for United States maritime commission, to Seattle-Tacoma Shipbuilding Corp.

3975 tons, five C-1 type cargo vessels, United States maritime commission, to Western Pipe & Steel Co., San Francisco.

3000 tons, apartment house, New York, for 240 Central Park South Inc., to Bethlehem Steel Co., Bethlehem, Pa.

1800 tons, bridge over Salt creek, relocation of Southern Pacific railroad, Delta, Calif., for department of interior, to American Bridge Co., Pittsburgh.

1500 tons, bridge over O'Brien creek, relocation of Southern Pacific railroad, Delta, Calif., to Bethlehem Steel Co., Bethlehem, Pa.

1300 tons, paper mill, at Plymouth, N. C., for Kieckhefer Container Co., Delair, N. J., to Bethlehem Steel Co., Bethlehem, Pa.

1200 tons, building, for United Benefit Life Insurance Co., Omaha, Nebr., to Omaha Steel Works, Omaha.

900 tons, bridge, Marshall street, Youngstown, O., for city, to Bethlehem Steel Co., Bethlehem, Pa.

700 tons, Ida B. Wells housing project, Chicago, for Chicago Housing authority, to New City Iron Works, Chicago.

430 tons, two oil barges, Cape Girardeau, Mo., to American Bridge Co., Pittsburgh.

415 tons, dam, Franklin Falls, N. H., to American Bridge Co., Pittsburgh.

400 tons, garage, shop building and gun sheds, Fort Totten, N. Y., to Belmont Iron Works, Eddystone, Pa.

300 tons, curbing, East River drive, New York, for city, to Eggleston Bros. & Co., Long Island City, N. Y.

300 tons, alterations to Atlantic works, for National Lead Co., Brooklyn, N. Y., to American Bridge Co., Pittsburgh.

300 tons, machine and pipe shop, Portsmouth, N. H., for United States government, to Lehigh Structural Steel Co., Allentown, Pa.

300 tons, yard structures, for Commonwealth Edison Co., Chicago, to Bethle-

Shape Awards Compared

	Tons
Weew ended Sept. 23	24,408
Week ended Sept. 16	47,130
Week ended Sept. 9	13,816
This week, 1938	13,065
Weekly average, year, 1938	21,568
Weekly average, 1939	22,666
Weekly average, August ...	18,739
Total to date, 1938.....	739,898
Total to date, 1939	861,299

Includes awards of 100 tons or more.

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SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

COLD ROLLED STRIP STEEL

BRIGHT FINISH UNCOATED, AND ELECTRO COATED IN NICKEL, BRASS, COPPER, BRONZE, ZINC, AND TIN

hem Steel Co., Bethlehem, Pa.

300 tons, bakery building, for Paul Schulze Biscuit Co., Chicago, to Wendnagel & Co., Chicago.

300 tons, tunnel at Seward, Alaska, barriers for Lake Washington bridge, Seattle, and miscellaneous, to Standard Steel Fabricating Co. & Boiler Works, Seattle.

250 tons, automatic shop, Newport, R. I., for United States navy, to Bethlehem Fabricators, Bethlehem, Pa.

240 tons, experimental building, Lockheed Aircraft Corp., Burbank, Calif., to Consolidated Steel Corp., Los Angeles.

235 tons, regional high school, Little Falls, N. Y., to Selbach-Meyer Co., New York.

230 tons, steel piling, Wildwood-Cape May, N. J., to Bethlehem Steel Co., Bethlehem, Pa., through A. C. Wescoat Co., contractor, Atlantic City, N. J.

200 tons, for remodeling of Grand theater, Cincinnati, to Jones & Laughlin Steel Corp., Pittsburgh .

160 tons, high school, Indianapolis, to Hetherington & Berner Inc., Indianapolis.

155 tons, state bridge RC-4038, Catskill, N. Y., to Anthracite Bridge Co., Scranton, Pa.

150 tons, pumping stations, Wilkes-Barre, Pa., for United States government, to unstated fabricator.

145 tons, building, National Lead Co., Sayreville, N. J., to Savary & Glaeser.

140 tons, clamp arms and bus frames, Alcoa, Tenn., to McKee Oliver Co., Pittsburgh.

140 tons, Woolworth store, Wilmington, Del., to Bethlehem Contracting Co., Bethlehem, Pa.

140 tons, addition to building No. 2, Bronx veterans administration, to Lehigh Structural Steel Co., Allentown, Pa.

140 tons, stock house, Griesedieck Bros., St. Louis, to Stupp Bros. Bridge & Iron Co., St. Louis.

135 tons, municipal hospital, Pittsburgh, to Pittsburgh Bridge & Iron Co., Pittsburgh.

125 tons, bridge, FAGM 2-D-(1), Howell county, Missouri, to Stupp Bros. Bridge & Iron Co., St. Louis.

123 tons, warehouse, Fibreboard Products Inc., Antioch, Calif., to Moore Drydock Co., Oakland, Calif.

105 tons, seminary building, Brighton, Mass., to West End Iron Works, Cambridge, Mass.

100 tons, New York state highway bridge, FAS-RC4068, Washington county, to Phoenix Bridge Co., Phoenixville, Pa.

100 tons, factory, Royersford, Pa., to American Fabricated Steel Co., Philadelphia, through W. W. Linsey, Philadelphia.

Shape Contracts Pending

8400 tons, including 6000 tons sheet steel piling, two drydocks, Pearl Harbor, T. H. bids recently opened.

2500 tons, two seaplane hangars, specification 8621, naval air base, Alameda, Calif.; bids Sept. 27.

1500 tons, two suspension bridges for state near Scotia, Calif.; bids soon.

1500 tons, apartment house, 1150 Park avenue Corp., New York.

1300 tons, bank building, for Commercial National bank, Shreveport, La.

1200 tons, sub-assembly shop, Norfolk, Va., for United States navy.

1100 tons, powerhouse Philadelphia Electric Co., Chester, Pa.; bids Sept. 25.

1000 tons, warehouse, Lit Bros., Philadelphia; also 1500 tons bars; bids this week.

1000 tons, transmission towers, Bonneville dam, Oreg.; bids opened.

800 tons, Bell Telephone building, Ninth and Race streets, Philadelphia.

725 tons, state bridge RC-4073, Salamanca, N. Y.

700 tons, power plant and store house, specification 8990, naval air base, Alameda, Calif.; general contract to K. E. Parker Co., 135 South Park, San Francisco.

700 tons, warehouse, for James McSweeney, New York.

500 tons, state of Illinois projects; bids Sept. 26.

325 tons, reconstruction of Williamsburg bridge, New York, for city.

300 tons, state bridge FAP-210-F, Wamsutter, Wyo.

300 tons, addition, Frankford arsenal, Frankford, Pa., bids Oct. 16.

300 tons, bureau of roads bridge, Alsea

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Behind the Scenes with STEEL

Mr. Schwab

■ "If I had my life to live over again, even with its troubles and mistakes, I wouldn't change a single thing. I've been a lucky man in my life—lucky in my long years, happy with one wife—with wealth, friends and good disposition." It is indeed a lucky man who can make such a statement and mean it, but it is a modest man who credits good fortune alone for such a life. Ability, contentment, understanding, humanity, optimism, enthusiasm and honesty come first with all great men, and so it was with Charles M. Schwab.

Allen Caught Peeking

■ Buick, in a national newspaper advertising campaign last week, gave STEEL the nod by quoting prominently from Mirrors of Motordom even if, at the same time, they did rib Detroit editor Art Allen with a caricature drawing of him peeking through the 1940 automotive keyhole. Allen says it was a good likeness, including the sparse hair and the baggy knees, but he revolts at the thought of carrying a notebook and pencil. It is rumored that some years ago Allen swallowed a complete Ediphone set which starts operating now when he softly clears his throat. Disguised as anything from an Indian Maharajah to a Western Union boy he thus gets into Detroit's inner sanctums and innocently records those priceless pearls that are yours each week in Mirrors of Motordom.

Show On Paper

■ We feel sure you'll be well pleased with STEEL's armchair Machine Tool Show which is presented as a special insert in this week's issue—which incidentally came to you in a rather snappy new mailing envelope. The pictorial section, "Versatile New Machines," gives you an exhibit of the new developments you would have seen at Cleveland and the articles by Machine Tool Editor Guy Hubbard and Warner & Swasey's Clifford S. Stilwell outline a picture of the progress to date and the expected trends in the future. The advertisers back this whole job up with a bang-up show of their own.

Blessed Event

■ Congratulations to Fafnir for the "Birth of a Bearing" on pages 124-125. We understand everyone concerned is doing well.

A Real Story

■ It is not often that we can get very excited about 50th anniversaries and the attending ballyhoo that usually accompanies the year-long celebration by the company. Once in awhile some one does it differently and our hats are off to Standard Oil of Indiana for their excellent booklet entitled, "The First Fifty." It is a history of a company and an industry so well done that it holds your interest to the very last page. They undoubtedly have some copies to spare if you think you'd like one.

Nice Job

■ A good estimate of the number of persons who see a front cover on any issue of STEEL is somewhere around a half-million. Few have been the covers more effective than this week's message by Warner & Swasey.

Let's Take It Easy

■ The epidemic of thinking in the country today that "sooner or later we'll *have* to get into the mess over in Europe" can be stopped only when each of us individually refuses to be a sponge soaking up half-truths and bald lies. . We're all "sidewalk superintendents" and "grandstand coaches" at heart and, although it's an awful show to sit and watch, our best bet, and perhaps our salvation, is to stay relaxed in our seat. So long as they don't go too far out of bounds and start fighting in the grandstand, for gosh sakes let's don't start throwing pop bottles.

SHRDLU

river, Oreg.; bids at Portland, Oreg., Sept. 27.

275 tons, bridge, Center street, Oil City, Pa., for Venango county, Pennsylvania.

275 tons, building, for Linde Air Products Co., Duquesne, Pa.

250 tons, two highway bridges, Queens, New York, for city of New York.

250 tons, state bridge FAS-8534, Apex, N. Y.

225 tons, Russian River bridge, Mendocino county, Calif., for state; general contract to Trewhitt, Shields & Fisher, 1501 Pacific S. W. building, Fresno, Calif., at $97,389.

220 tons, high school, Lead, S. Dak.

200 tons, gymnasium, University of Nevada, Reno, Nev.; bids soon.

200 tons, mill building, for Rome Cable Corp., Rome, N. Y.

200 tons, tank building 1, for Pittsburgh Plate Glass Co., Ford City, Pa.

200 tons, building, for Corning Glass Co., Corning, N. Y.

125 tons, building, for Montgomery Ward & Co., Plattsburg, N. Y.

100 tons, auditorium building, Juniata college, Huntington, Pa.; bids Sept. 30.

100 tons, Highland Park post office, Detroit, bids in.

Unstated, double leaf bascule state bridge, Coos county, Oreg.; bids at Portland, Oreg., Sept. 28.

Unstated, gates and hoists for Roza project, Washington state, and other projects; bids to Denver, Sept. 29.

Unstated, steel tower transmission line, Ampere to Kelso, Wash.; H. H. Walker Inc., Los Angeles, low.

Reinforcing

Reinforcing Bar Prices, Page 171

Pittsburgh—Orders are sustained, but inquiries are tapering. However, some sellers are practically out of the market because other bar demand has tied up capacity to such an extent that production of concrete material has become more or less a fill-in business. Prices are firm.

Chicago—Higher prices on reinforcing bars are looked for shortly. The market generally has been steady lately, but costs are rising, particularly among rail steel producers. An increase at this time

Concrete Bars Compared

	Tons
Week ended Sept. 23	**7,676**
Week ended Sept. 16	**2,450**
Week ended Sept. 9	**13,750**
This week, 1938	**5,113**
Weekly average, year, 1938	**6,959**
Weekly average, 1939	**9,639**
Weekly average, August	**7,894**
Total to date, 1938	**250,176**
Total to date, 1939	**366,271**

Includes awards of 100 tons or more.

would have little immediate effect, since mills already are heavily booked for a number of weeks.

Boston—Reinforcing steel bar buying is in small lots, exceptions being 1050 tons for a dam, New Hampshire, and several housing projects in the Boston district about to be closed.

Philadelphia—Inquiry is featured by 1500 tons for the Lit Bros. warehouse here and 600 tons for a culvert near Kensington, Pa. for army engineers. A large tonnage will be required for a $1,000,000 housing project at Harrisburg, Pa., bids Sept. 26, also for housing work, Reading, Pa., bids Oct. 26.

Seattle — Market conditions are fairly active, with tonnages small. Prices are firm and unchanged. Seattle Steel Co. has booked 108 tons for a plant addition for Carstens Packing Co., Tacoma.

San Francisco—Reinforcing steel bar lettings were the largest for any week in over a year and totaled 8686 tons, bringing the aggregate to date to 126,865 tons, compared with 102,077 tons for the same period a year ago.

St. Louis—Awards are light, but the outlook is brighter than a month ago. Pending business includes 640 tons for a flood wall at Tell City, Ind. Illinois takes bids this week on a large tonnage for highway work.

Reinforcing Steel Awards

3438 tons, including 650 tons mesh, improvement Los Angeles River channel, Los Angeles, to Blue Diamond Corp., Los Angeles.

1575 tons, power plant and store house, specification 8990, naval air base, Alameda, Calif., to Ceco Steel Products Corp., San Francisco.

700 tons, building, Marathon Paper Co., Menasha, Wis., to Inland Steel Co., Chicago; Permanent Construction Co., contractor.

483 tons, Abraham Lincoln school, San Francisco, to Bethlehem Steel Co., San Francisco.

400 tons, office building, 339 North Camden Drive, Beverly Hills, Calif., to Soule Steel Co., Los Angeles.

300 tons, dam, Westfield river, Knightsville, Mass., to Bethlehem Steel Co., Bethlehem, Pa.; George M. Brewster, contractor.

265 tons, Loyalhanna dam, near Saltsburg, Pa., for army engineers, Pittsburgh, to Bethlehem Steel Co., Bethlehem, Pa.; Great Lakes Dredge & Dock Co., contractor.

200 tons, building for Stephano Bros., Philadelphia, to American Steel Engineering Co., Philadelphia, through Barclay White, Philadelphia.

112 tons, warehouse, Fibreboard Products Inc., Stockton, Calif., to W. C. Hauck & Co., San Francisco.

108 tons, addition to Carstens Packing Co. plant, Tacoma, Wash., to Seattle Steel Co.

100 tons, traffic fin, Chicago, to Calumet Steel Co., Chicago.

Reinforcing Steel Pending

640 tons, flood wall, Tell City, Ind.; Parker Construction Co., Cincinnati, low bidder.

600 tons, two sewage plants and interceptors, Hammond, Ind., bids in.

500 tons, Abbott Hall, Northwestern university men's dormitory, Chicago. R. C. Wieboldt & Co., Chicago, general contractor.

500 tons, office building for state highway department, Los Angeles; bids opened.

500 tons, Kingston culvert, Wilkes-Barre, Pa., army engineers' office.

316 tons, paint shop and transformer building, navy yard, Mare Island, Calif.; new bids Oct. 4.

306 tons, for city of Cincinnati water reservoir; general contract to Ferro-Concrete Construction Co., Cincinnati.

290 tons, indoor arena, Capitol Garden Co., Washington.

255 tons, Russian Gulch bridge, Mendocino county, Calif., for state; R. G. Clifford, 215 Market street, San Francisco, low at $104,510.

195 tons, Coulee dam pumping plant; bids at Denver, Sept. 19.

179 tons, highway work in, Coos Columbia, Lane and Linn county, Oreg.; bids Sept. 28.

175 tons, paper mill at Plymouth N. H., for Kieckhefer Container Co., Delair, N. J.

156 tons, remodel Willamette river

FROM ORE TO METAL

The Story of St. Joe Electro-Thermic Zinc—Number 7 of a Series

IN THE BALMAT LABORATORY

WEIGHING SAMPLES

METALLURGICAL CONTROL is one of the most vital considerations in the mining, milling, smelting and refining of pure metals. This control actually begins underground at the Balmat and Edwards zinc mines of the St. Joseph Lead Company in northern New York, where selective mining and frequent sampling combine to provide the mill on the surface with a steady supply of uniform ore.

In the mill, samples are taken mechanically at each step of the process. Immediate analysis by the laboratory gives the operators complete control of the milling operations for each shift.

During the processing of concentrates at the Josephtown, Pa., smelter, for the production of metallic zinc, samples are taken at close intervals at all stages of manufacture, and each tap of metallic zinc from the condensers is sampled, analyzed and graded. In this way, not only the purity but also the uniformity of the zinc is rigidly controlled.

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PLANT AND LABORATORY, JOSEPHTOWN, BEAVER COUNTY, PENNSYLVANIA

bridge, Clackamas county, Oreg.; bids Sept. 28.

150 tons, navy building, Canal Zone, McCloskey & Co., Philadelphia, figuring general contract.

103 tons, over-crossing, Glendale boulevard, Los Angeles; bids Oct. 4.

100 tons, bridge at Firebaugh, Fresno county, California, for state; bids Oct. 4.

Unstated, state 372-foot concrete viaduct at Oregon City, Oreg., and other highway work; bids at Portland, Sept. 28.

Pig Iron

Pig Iron Prices, Page 172

Chicago — Deliveries this month likely will be the heaviest in two years. Orders are retarded by coverage prior to the $2 advance in prices, but some tonnage is being booked. Shipments of foundry coke this month are expected to be about 50 per cent ahead of August. Additional blast furnaces are being pressed into service, one interest planning to add one stack this week and two more next week.

New York — Export demand for pig iron, while still potentially large, has not yet resulted in many substantial orders and is below the volume many believe will be attained before the end of the year. Domestic buying has moderated, following recent coverage of fourth quarter needs. Shipments are well sustained.

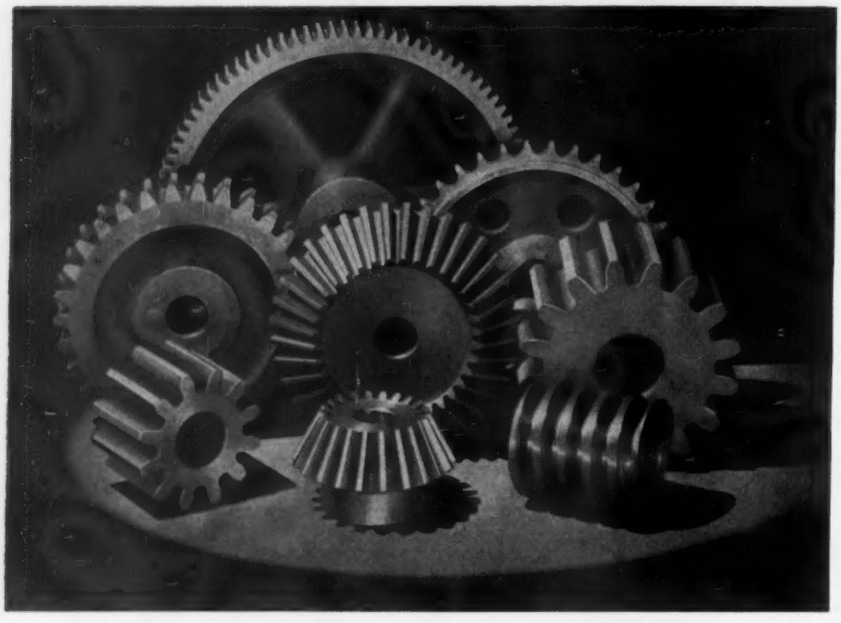
Philadelphia — Specifications reflect a scarcity of scrap, with accompanying sharp advances in prices of the latter. Although most consumers figured they were well covered the remainder of the year, some find it desirable to place additional tonnage at the $2 advance.

Cleveland—Shipments continue at the year's best rate, partly reflecting consumers' urgency to take delivery at contracts placed before the recent price increase. Soaring scrap prices also are stimulating iron movement. While new business is less active since the price advance, a fairly large volume is being received.

Buffalo — Considerable tonnage was placed prior to the $2 increase in prices, but fair business continues at the higher levels. Shipments are in the best volume in two years or more, with releases widely diversified. Movement to New England plants from this area is expanding.

Cincinnati—Coverage prior to the recent $2 advance in prices is restricting additional buying, but shipments are rising steadily. Some receipts are used to bolster low inventories, since expansion in the melt has lagged behind iron deliveries. Output of automotive castings is heavier, with machine tool requirements retaining district leadership.

Toronto, Ont.—Demand continues active, and most melters shortly are expected to be well covered for the remainder of the year. Business is being taken at unchanged prices, despite the recent advance in the United States.



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Scrap

Scrap Prices, Page 174

Pittsburgh—The market here still is in an uproar. Mills have boosted their offers, but brokers are unwilling to part with much material, and sales generally have been small. Brokers caught with short orders placed before the market rise have contributed to the upturn in prices which last week was extended an additional $2.50 in the case of No. 1 steel. Most published quotations are based on actual sales into consumption but do not reflect either average prices of all tonnage or the most common price. They merely represent sales made prior to press time on which verification has been secured.

Chicago — Quotations have risen another $2 in a highly unsettled market. The exact value of No. 1 steel is difficult to determine, a conservative estimate at the close of last week being $17.50 to $18. Unconfirmed mill purchases are reported at $18, although higher figures are named on dealer sales and railroad offerings.

Philadelphia — Fast advancing prices are bringing out more scrap, but supplies remain scarce with still higher quotations apparently in prospect before the market begins to level off. The market still is highly confused, with sellers more interested in buying scrap in many cases for coverage of prior orders than in booking new business. Little interest is shown in export business, particularly in view of the scarcity of bottoms.

Detroit — Prices still are surging upward in a somewhat hysterical market. Quotations are nominal in that they do not represent mill buying, although consumers are watching the situation carefully.

Buffalo — Scrap prices shot upward last week, with sales reported at increases of as much as $4 a ton. A sale of 6000 tons of No. 1 steel was made on the basis of $19.50 to

$20, compared with a nominal level of $16 to $16.50 a week ago. Rising prices have tended to restrict offerings, small sellers holding out for higher figures. Mills report no immediate prospect of a shortage in supplies.

Cincinnati—Quotations have moved higher, No. 1 steel being up $1 at $13.50 to $14. Some dealers are willing to pay more to cover contracts. Mills appear content to take light offerings at current prices, inventories being adequate for the present. Foundry demand has spurted.

St. Louis — Prices again have jumped sharply. Mills temporarily are out of the market, being well supplied with material in stock or under contract. Scrap is not plentiful, although latest price advances have stimulated country and railroad offerings.

Toronto, Ont.—Canadian government has placed an embargo on exports of iron and steel scrap, to conserve supplies for production of war materials. So far little influence on prices is noted. Demand is steady, but consumers have not rushed to cover future needs.

Warehouse

Warehouse Prices, Page 173

Cleveland—Sales are rising moderately, but so far have received little stimulus from the sold-out condition of mills, a situation expected to be more pronounced next quarter. Some warehouses are heavily stocked.

Distributors of hot-rolled alloy bars have increased quantity extras on lots of less than 2000 pounds, effective Oct. 1. This follows recent revisions in mill quantity extras which take effect the same date.

Chicago—Business has increased substantially so far this month, although the upturn has been more gradual than in mill sales. Further gains are in prospect the next several weeks.

Philadelphia — Warehouses look for September business to equal that of August, best month since late 1937. Swedish iron rounds and flats have been advanced to 7.50c and 8.50c, respectively.

Buffalo—Warehouses have not yet felt the full force of the heavy demand experienced by mills, but business is the best in two years. Distributors are increasing inventories.

Cincinnati—Warehouse sales are steadily better, with some mill customers buying fill-in items. Individual orders are heavier. Prices are unchanged.

Steel in Europe

Foreign Steel Prices, Page 173

London—(By Cable)—Pig iron output and stocks in Great Britain are satisfactory and production could be expanded if required. New commercial orders for iron and steel are practically stopped for the present but consumers appear sufficiently covered. Deliveries continue on previous contracts. Export trade has been entirely cut off.

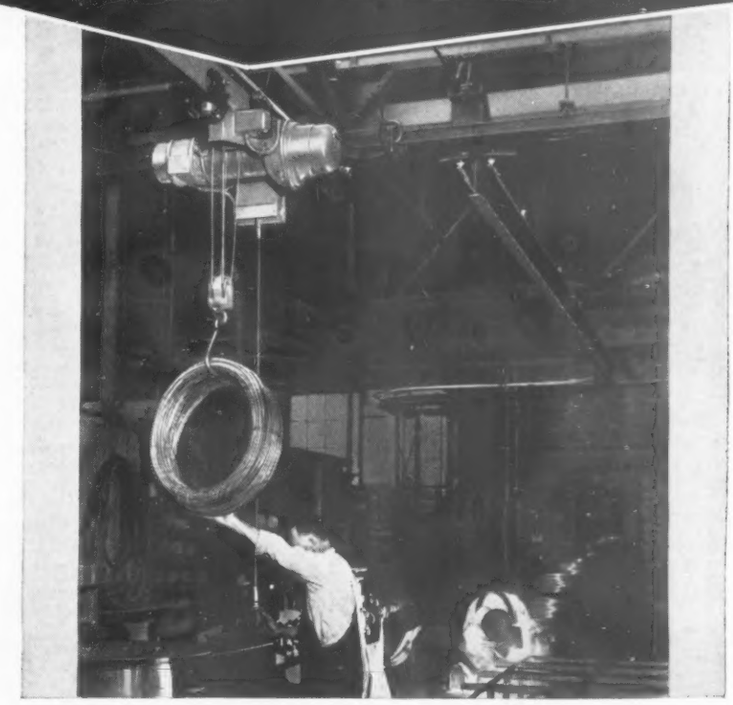
The Continent reports some export business with Scandinavia and Holland and deliveries to Great Britain continue.

"No Price Inflation" Is Lincoln Pledge

■ Companies pledging to maintain fair prices in today's sellers' market so that there may be no disastrous post-war deflation were joined last week by Lincoln Electric Co., Cleveland.

In a statement of policy President J. F. Lincoln declared other wars have brought largely unwarranted

P&H HEVI-LIFT HOISTS



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price inflation when sellers were in a dominant position, resulting inevitably in post-war reaction with depression and unemployment. Much of this might have been avoided by more foresighted pricing policies, he asserted. Mr. Lincoln pledged his company will maintain present prices as far as possible, raising them only to compensate for advances in raw material and labor costs.

Nonferrous Metal Prices

Sept.	Copper Electro, del. Conn.	Copper Lake, del. Midwest	Copper Casting, refinery	Straits Tin, New York Spot	Straits Tin, New York Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
16	12.00	12.00	12.25	*	*	5.50	5.35	6.25	20.00	13.00	35.00
18	12.00	12.00	12.25	*	47.00	5.50	5.35	6.25	20.00	13.00	35.00
19	12.00	12.00	12.25	*	46.00	5.50	5.35	6.25	20.00	13.00	35.00
20	12.00	12.00	12.25	*	47.00	5.50	5.35	6.25	20.00	13.00	35.00
21	12.00	12.00	12.25	*	*	5.50	5.35	6.25	20.00	13.00	35.00
22	12.00	12.12½	12.25	*	*	5.50	5.35	6.25	20.00	13.00	35.00

* Nominal.

MILL PRODUCTS

F.o.b. mill base, cents per lb., except as specified. Copper brass products based on 12.00c Conn. copper

Sheets

Yellow brass (high) 18.65
Copper, hot rolled 20.37
Lead, cut to jobbers 8.30
Zinc, 100 lb. base 11.00

Tubes

High yellow brass 21.40
Seamless copper 20.87

Rods

High yellow brass 13.97
Copper, hot rolled 16.87

Anodes

Copper, untrimmed 17.62

Wire

Yellow brass (high) 18.90

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York 7.87½-8.00
Cleveland 9.00-9.25
Chicago 8.12½-8.37½
St. Louis 8.50-8.75

Heavy Copper and Wire

New York, No. 1 .....9.50-9.75
Cleveland, No. 1 .....9.50-9.75
Chicago, No. 1 .....9.62½-9.87½
St. Louis 9.75-10.00

Composition Brass Turnings

New York 7.50-7.75

Light Copper

New York 7.50-7.75
Cleveland 7.75-8.00
Chicago 7.62½-7.87½
St. Louis 7.75-8.00

Light Brass

Cleveland 4.50-5.00
Chicago 5.37½-5.62½
St. Louis 5.00-5.50

Lead

New York 4.85
Cleveland 4.50
Chicago 4.25-4.50
St. Louis 4.00-4.25

Zinc

New York 3.50-3.75
Cleveland 3.00
St. Louis 3.50-3.75

Aluminum

Mixed, cast, Cleveland 8.25-8.50
Borings, Cleveland 6.75-7.00
Clips, soft, Cleveland 15.25-15.50
Misc. cast, St. Louis 8.00-8.25

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads..13.75
Standard No. 12 aluminum...13.25-13.50

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Tin Plate

Tin Plate Prices, Page 170

Tin plate production at a number of mills has risen to capacity, output for the industry last week being estimated at 80 per cent, up 12 points. This represents virtually 100 per cent operations for active units. Business has expanded markedly despite the waning canning season. The revival in demand results from anticipated business for canned food in the export market, as well as from low stocks of tin plate in hands of canmakers who wish to be protected against a possible price rise.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 171

Bolt and nut production is rising, recently being around 50 per cent and expected to reach 70 to 75 per cent by mid-October. Specifications are up sharply from practically all directions, particularly for track accessories and equipment repairs and automobile building.

Nonferrous Metals

New York—There was no major price change in domestic markets last week, except in tin, and consumer inquiry was filled rather fully. Undertone of the markets remained strong, however, due to heavy shipments and increasing consumption.

Copper—Following an advance of ⅛-cent in Lake copper to 12.12½c, delivered midwest, on Friday consumer inquiry for all grades increased. Producers continued to allocate electrolytic sales to regular customers. Activity in the export market was negligible with prices quoted around 11.50c to 12.00c, f.a.s. New York.

Lead—Further assurances that no shortage of lead is likely to develop and that the present price level is "fair" tended to firm the domestic market at 5.35c, East St. Louis. Offerings were made freely.

Zinc—Sales were heavier than had been expected in view of the recent active buying but they showed a decline from the preceding week's turnover. Fair sized tonnages were booked for October delivery and moderate tonnages were booked for first quarter. Prime western held at 6.25c, East St. Louis.

Tin—Prices fluctuated widely with spot remaining tight at around 68.00c to 70.00c and futures at around 49.50c. Metal afloat to this country likely will correct the scarcity of spot supplies shortly.

Quicksilver — Prices have soared about $75 per flask since the first of the month and are now quoted at $150 to $160 per 76-pound flask.

Iron Ore

Iron Ore Prices, Page 174

Cleveland—Thirty-four additional bulk freighters were placed in service on the Great Lakes between Aug. 15 and Sept. 15, according to a compilation by C. C. Lindeman, statistician for the M. A. Hanna Co. This brought the total number of boats in operation to 264, or 87.13 per cent of all units. Of this number 258 were engaged in the ore trade. A year ago 142 vessels, or 46.41 per cent of the total, were active, 106 of them being in the ore trade.

August consumption of Lake Superior iron ore totaled 3,775,132 gross tons, against 3,143,337 in July and 2,076,819 a year ago, according to the Lake Superior Iron Ore association. Consumption the first eight months was 23,889,355 tons, against 14,417,827 tons a year ago.

Iron ore on hand Sept. 1 was less than stocks as of the corresponding 1938 date. Details in gross tons:

	At Furnaces	On Lake Erie Docks	Total
Sept. 1, 1939	28,365,093	4,349,279	32,714,372
Month ago..	24,195,916	4,311,327	28,507,243
Year ago....	31,758,819	5,291,519	37,050,338

New York — Firm offers of 50 cents per unit without duty, Atlantic coast ports, subject to variation in ocean rates at time of delivery, are being offered for South African manganese ore, 50 to 52 per cent. Some Russian manganese is reported available around this figure on a few scattered cargoes. Domestic consumers are moving cautiously, it being estimated by one authority that 1,250,000 tons of manganese ore are held by users in this country.

Construction and Enterprise

Ohio

ATTICA, O.—North Central Electric Co-operative Inc., city, plans construction of 92 miles rural transmission line in five counties; cost $86,000. REA has allotted funds for project which probably matures soon.

BELLEFONTAINE, O.—Logan county co-operative power and light association, E. G. Denmead, president, has been allotted $139,000 REA fund which matures soon, for construction of rural transmission line.

BELLEFONTAINE, O.—City, John W. Thatcher, Municipal hall, service director, plans municipal generating plant additions and improvements, including boiler plant accessories, valves and piping, pumps, deaerator, ash handling equipment. Bids due noon, Sept. 28, accompanied by 5 per cent certified check or bond.

CLEVELAND, O.—City, George Oxer, commissioner, division of light and power, city hall, will take bids due noon, Oct. 6, on coal handling apparatus, installed, comprising: 25-foot extension to present scraper conveyor; 42-inch conveyor belt, 24 feet long, with magnetic pulley; ring type crusher, capacity 250 tons per hour; 30-inch conveyor belt, 385 feet long; 30-inch conveyor, belt enclosed, 175 feet long; 30-inch conveyor, belt enclosed, 150 feet long; 30-inch conveyor belt, 143 feet long, with traveling tripper; scraper type storage and reclaiming system; 42-inch apron feeder, 16 feet long; 42-inch conveyor belt, 60 feet long, with magnetic pulley to remove tramp iron; steel transfer chute; 30-inch conveyor belt, 175 feet long. L. A. Quayle, Auditorium Garage building, utilities engineer. Certified check, 5 per cent bid bond required.

GNADENHUTTEN, O.—Village, R. M. Blackburn, mayor, plans special $24,000 bond issue election Nov. 7, for sewage treatment plant and sewer system to cost $130,000. Henry Moore, New Philadephia, engineer.

GREENVILLE, O.—Darke Rural Electric Co-operative Inc., Rollin Miller, superintendent, Eldorado, O., has been granted $94,000 REA fund for construction of 90 miles rural transmission line in Darke, Preble counties. Lamour-Douglas, Chicago, consulting engineers.

HAMILTON, O.—Butler Rural Electric Co-operative Inc., 710 Greenwood avenue, Leroy Lamborn, manager, has secured $80,000 REA grant for construction of 81 miles rural transmission line in Preble, Montgomery, Butler, Hamilton counties. Laramore & Douglas, Chicago, engineers.

KENTON, O.—United Rural Electric Inc., W. C. Ewing, R.F.D. 2, manager, plans construction of 101 miles rural transmission line, to cost $150,000, in Hardin, Allen, Auglaize counties. REA has allotted $133,000 which probably matures soon.

LANCASTER, O.—South Central Rural Electric Co-operative Inc., Darwin Kindler, manager, has been allotted $95,000 REA fund for construction of 94 miles rural electric transmission line in five counties. Gibbs & Hill Inc., Pennsylvania station, New York, engineers.

NORTH FAIRFIELD, O. — Firelands electric co-operative, D. C. Hawn, president, plans construction of 100 miles rural transmission line in Huron, Richland, Ashland counties. Washington has given approval; will mature at once.

PAULDING, O. — Paulding-Putnam Electric Co-operative Inc., Homer Prowant, vice president, plans construction of 160 miles rural transmission line in six counties. REA has allotted organization $166,000, which probably matures soon. Putnam & Woolpert, 132 North Main, Dayton, O., engineers.

PERRYSVILLE, O.—Village, C. L. Miller, mayor, plans special $62,380 bond issue election Nov. 7, for sanitary sewerage, sewage treatment plant. E. D. Barstow, 31 North Summit street, Akron, O., consulting engineer.

Pennsylvania

WILLIAMSPORT, PA. — Bethlehem Steel Co.'s Williamsport Wire Rope division has purchased three-acre site adjoining plant here, plans erection of addition to local plant.

Indiana

DECATUR, IND.—City plans power plant enlargement. Type and size of improvement not determined yet. To cost about $500,000. Froehlich & Emery Engineering Co., Second National Bank building, Toledo, O., engineers.

District of Columbia

WASHINGTON—M. J. Uline, 3601 Con-

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640 Central Ave., Pontiac, Mich.

necticut avenue N. W., plans erection of ice skating rink, to cost $250,000. Joe Harry Lapish, 744 Jackson place, N. W., architect.

WASHINGTON — General purchasing officer will open bids at 10:30 a.m., Oct. 4, on one or two stiff-legged, electrically operated, 90-ton capacity derricks, delivery complete to Panama canal zone.

WASHINGTON—Bureau of yards and docks opens bids Oct. 4 (postponed from Sept.20) for three electric elevators for naval hospital at Pensacola, Fla.

WASHINGTON — General purchasing officer opens bids at 10:30 a.m., Sept. 28, on three to six diesel engine driven air compressors, heavy duty type, 1140 cubic feet free air per minute capacity, against pressure of 125 pounds at sea level, to be equal to type 8-XVO, shown on page 13, Ingersoll-Rand catalog Form 3072.

WASHINGTON — General purchasing officer opens bids at 10:30 a.m., Sept. 28, on one mobile unit trenching machine, complete with conveyor, mounted on crawlers, to cut ditches up to ten feet deep and not less than 30 inches wide; not to exceed ten tons in weight, to be sufficiently powered for desired service. Earliest practicable delivery to Panama canal zone desired.

Kentucky

DANVILLE, KY. — Inter-County Rural Electric Co-operative Corp. has $71,000 REA fund allotment.

GLASGOW, KY.—Farmers' Rural Electric Co-operative Corp. has REA allotment of $157,000.

LIVERMORE, KY.—Green River Chair Co. plant damaged by fire, loss $100,000.

OWENTON, KY.—Owen County Rural Electric Co-operative Corp. has secured REA allotment of $267,000.

Florida

JACKSONVILLE, FLA.—City may vote soon on $800,000 bonds for series of port improvements including grain elevator, bonded warehouse, cold storage and fruit terminal.

JACKSONVILLE, FLA.—Foundry and workshop, American Coolair Corp., 3604 Mayflower street, damaged by fire; loss $30,000.

JACKSONVILLE, FLA.—General Tung Oil Corp., 10 Rockefeller Plaza, New York, Carter B. Carnegie, president, investigating water front site here for erection of paint and varnish factory; chemical laboratory is to be established at Jacksonville plant.

PENSACOLA, FLA.—Construction on proposed paper plant for Florida Pulp & Paper Co., formed by J. H. Allen, Savannah, Ga., A. D. and J. C. Pace, Pensacola, will start on or about Feb. 1, 1940.

Georgia

ATLANTA, GA. — Upchurch Packing Co., 16 Brady avenue, plans rebuilding burned plant.

Mississippi

CLARKSDALE, MISS.—Coahoma electric power association has REA allotment of $142,000.

HOLLANDALE, MISS.—Twin county electric power association has REA allotment of $60,000.

South Carolina

AIKEN, S. C.—Aiken county rural electric co-operative has been granted $25,000 REA loan for construction of cold storage plant. Will be operated by Aiken Food Storage Corp.

CHARLESTON, S. C.—City, Henry W. Lockwood, mayor, authorized 25-year lease on 36 acres to Chicago firm planning to establish box, carton, container factory.

WINNSBORO, S. C.—Fairfield Electric Co-operative Inc. receives bids Sept. 28 on construction of 150 pole miles primary, secondary lines in Fairfield, Kershaw, Chester counties; 348 watt-hour meters; pole inspection service to be considered separately. J. B. McCarthy Engineering Corp., Atlanta, Ga., engineers.

Tennessee

DANDRIDGE, TENN.—Dandridge Implement Co. building damaged by fire with $35,000 loss.

Louisiana

LAFAYETTE, LA.—Southwest Louisiana Electric Membership Corp. has been granted REA allotment of $98,000.

LAKE CHARLES, LA.—Lake Charles dock board will install automatic sprinkler system at public docks. F. Shutts Sons, engineers, will prepare plans, call for bids; cost $40,000.

MORGAN CITY, LA.—City, Maurice D. Shannon, mayor, receives bids Oct. 2 for furnishing and installing complete, 2-cycle diesel engine approximately 1050-horsepower generating unit, including foundations, complete with switchboard, all accessories; two Woodward governors, two regulators for present units; construction of subsidence basin, 55 x 114 x 13 feet, including pipe, fittings, mixing chamber, chemical feed machine and chemical supply building.

RUSTON, LA.—C. E. Andrews has contract, at $105,998, for construction of power plant.

Virginia

WINCHESTER, VA.—Winchester Coca Cola Bottling Works Inc., E. E. Harbaugh, manager, has acquired site for erection of plant.

Missouri

ST. LOUIS—Levison & Blythe Ink Co., 209 Locust street, leased 5-story and basement building; installing elevator, heating, sprinkling systems.

Arkansas

JONESBORO, ARK. — Craighead Electric Co-operative Corp. has been granted REA allotment of $150,000.

Minnesota

BENSON, MINN.—City, S. A. Berg, clerk, is taking bids to Sept. 29, 7:30 p.m., on one switchboard panel and connections for municipal heating, generating plant as per specifications obtainable from Burlingame, Hitchcock & Estabrook, 521 Sexton building, Minneapolis, consulting engineers. Certified check 10 per cent to accompany bid.

BIRD ISLAND, MINN.—Village, Gustave Steffen, clerk, is taking bids to 8 p.m., Oct. 2, on construction, labor and material, of deep well turbine pump as per specifications obtainable from Ealy G. Briggs, 1955 University avenue, St. Paul, consulting engineer. Certified check 5 per cent to accompany bid.

Texas

BONHAM, TEX.—Fannin County Electric Co-operative Inc., Taylor Holcomb, Trenton, Tex., temporary chairman, has $126,000 REA allotment for construction of rural electric line to serve 474 customers.

GALVESTON, TEX. — Gulf Marine Ways, incorporated by A. J. Piperi, 3228 K street, and associates, plans construction of machine shop, marine ways; work under way.

OLNEY, TEX.—Ft. Balknap Co-operative Inc. has REA allotment of $131,000.

ROBSTOWN, TEX.—City, John W. Kellam, mayor, will have plans ready about Sept. 30 for bids on power plant engine generator set. Garrett Engineering Co., Richmond avenue, Houston, Tex., engineers.

TEXAS CITY, TEX.—Republic Oil Refining Co., Houston, Tex., plans doubling

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capacity of cracking plant; engineering details under way; cost $75,000.

Kansas

SUMMERFIELD, KANS.—City, H. A. Berens, mayor, has filed application with WPA for waterworks improvement to cost $36,000. Paulette & Wilson, 311 Farmers' Union building, Salina, Kans., consulting engineers.

Nebraska

BAYARD, NEBR.—Chimney Rock rural public power district has $25,000 REA allotment for construction of 40 miles rural transmission line.

WAYNE, NEBR.—Wayne county rural public power district has been granted $174,000 REA fund for construction of 214 miles rural transmission line.

Iowa

CLARION, IOWA—Wright county rural electric co-operative has received $145,000 REA allotment for construction of rural transmission line.

ESTHERVILLE, IOWA—D. E. K. rural electric co-operative has $60,000 REA fund for construction of rural transmission line.

ELDORA, IOWA—State board of control, D. R. McCreery, chairman, Des Moines, Iowa, will take bids soon on construction of sewage treatment plant at boys' training school, to cost $30,000. Henry J. Liebbe, State House, Des Moines, Iowa, is state architect.

ELDORA, IOWA — City, George Shafer, clerk, is preparing plans for sewage disposal plant construction. Howard R. Green Engineering Co., 417 First avenue, Southeast, Cedar Rapids, Iowa, consulting engineer.

GLENWOOD, IOWA—State board of control, D. R. McCreery, chairman, will take bids soon on water tank and tower construction at school for feebleminded, to cost $20,000. Henry J. Liebbe, State House, Des Moines, Iowa, is state architect.

HARLAN, IOWA—Nishnabotna valley rural electric co-operative has secured REA allotment of $135,000 for construction of rural transmission line.

INDEPENDENCE, IOWA—State board of control, D. R. McCreery, chairman, will take bids soon on water tank and tower construction at state hospital here, to cost $20,000. Henry J. Liebbe, State House, Des Moines, Iowa, is state architect.

ONAWA, IOWA—Monona county rural electric co-operative has received $160,000 REA fund to finance construction of rural transmission line.

STORM LAKE, IOWA—Buena Vista county rural electric co-operative has $114,000 REA fund for construction of rural transmission line.

THOMPSON, IOWA—Winnebago rural electric co-operative has secured $110,000 REA fund for construction of rural transmission line.

WOODBINE, IOWA—Harrison county rural electric co-operative has been allotted $117.000 REA fund to finance construction of rural transmission line.

WOODWARD, IOWA—State board of control, D. R. McCreery, chairman, Des Moines, Iowa, will take bids soon on construction of water filtration plant at school for epileptics, to cost $40,000. Henry J. Liebbe, State House, Des Moines, Iowa, is state architect.

Pacific Coast

LOS ANGELES—Security Valve Co., L. M. Soare, Fillmore Rose, T. P. Hedderman, directors, has been incorporated. Young & Kelley, 634 South Spring street, represent the corporation.

LOS ANGELES—Andrews Hardware & Metal Co., with 1500 shares no par value stock, Dorsey G. Andrews, Donald H. Andrews, Chalmers L. McGaughey, directors, has been incorporated. O'Connell & McGaughey, Title Insurance building, represent the corporation.

LOS ANGELES—Standard Enameling Co., with capital stock of $100,000 has been incorporated. Henry Honer, Robert Sherrill, Los Angeles, and F. L. Wolfenden, San Francisco, are directors. Henry H. Irwin, Central Bank building, Oakland, Calif., represents the company.

LOS ANGELES—Economy Pipe & Supply Co., with 2000 shares no par value stock has been incorporated. Max Peterman, Harris M. Fields, Albert Levinson, are directors. Lawrence Cobb, 215 West Seventh street, is attorney, representative.

PORTLAND, OREG. — Bonneville authority has called bids Oct. 6 for construction of 100,000 volt power transmission line between Chehalis and Raymond, Wash., distance, 46 miles.

SPRINGFIELD, OREG. — Booth-Kelly Co. has begun construction of $500,000 veneer plant for Washington Veneer Co., Olympia, Wash., on 27-acre site recently acquired. Modern equipment, including hot press type machinery, steam power plant, will be installed.

ELLENSBURG, WASH. — Bennett & Taylor Co., Los Angeles, is low bidder, at $97,638, for construction of 125 miles rural transmission line in public utilities' district No. 1.

SEATTLE—City has approved $1,000,000 bond issue for substation construction, new transmission lines, other improvements at Skagit power, light project.

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Morgan Engineering Co., The, Alliance, O.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

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BABBITT METAL
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BAGS (Cotton)
Ames Bag Machinery Co., 1991 E. 66th St., Cleveland, O.

BALING PRESSES
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

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Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

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SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.
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Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
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Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

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Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

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Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
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Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
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Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
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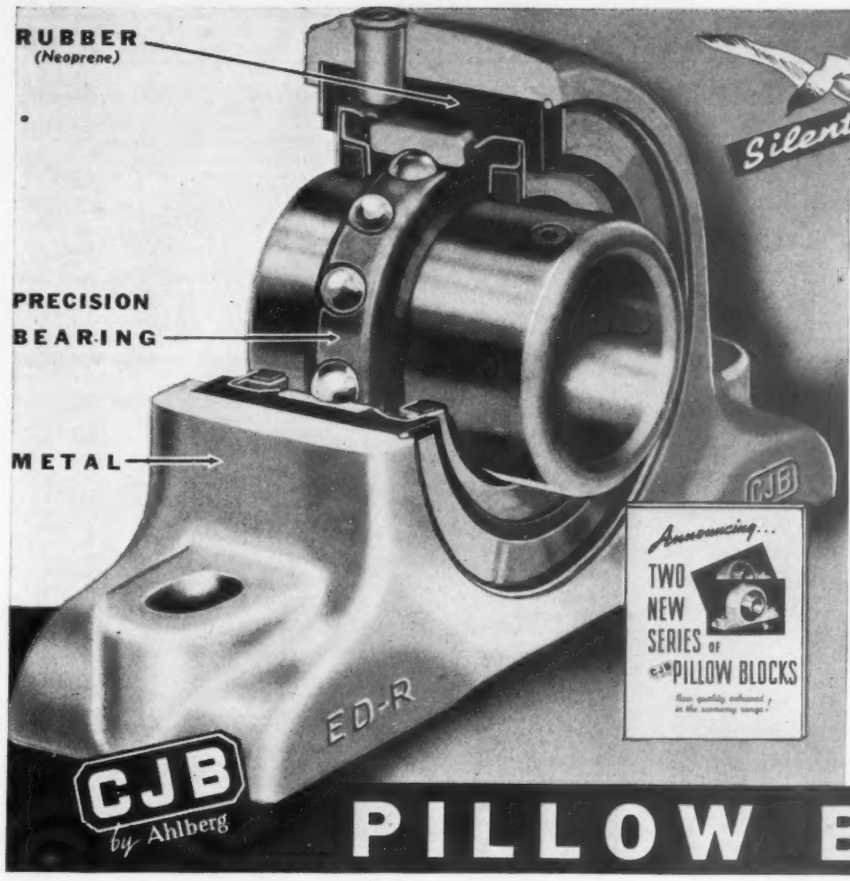

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BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Track)—See TRACK BOLTS

BORING MACHINES (Precision)
Heald Machine Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
National-Erie Corp., Erie, Pa.
Union Steel Casting Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

BRAKE LININGS
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

BRAKES (Hydraulic)
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

BRAZING EQUIPMENT
American Gas Furnace Co., Elizabeth, N. J.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Acid Resisting)
Keagler Brick Co., 1443 W. Market St., Steubenville, O.

BRICK (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES (Bridge)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BRUSHES (Industrial)
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Beatty Machine & Mfg. Co., Hammond, Ind.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BUNGS (Rubber)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BURNERS (Fuel, Oil, Gas, Combination)
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, O.

BUSHINGS (Oilless)
Rhoades, R. W., Metaline Co., 50 3rd St., Long Island City, N. Y.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAR DUMPERS
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

CARBIDE
Linde Air Products Co., The 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

CARBURIZERS
Houghton, E. F. & Co., 240 W. Somerset St., Philadelphia, Pa.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTINGS (Acid Resisting)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Meehanite Metal Corp., Pittsburgh, Pa.
National Alloy Steel Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell St., Chicago, Ill.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Brass, Pressure)
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Columbia Steel Co., San Francisco, Calif.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango Penn Mold Co., Dover, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
National Alloy Steel Co., Blawnox, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Malleable)
American Chain & Cable Co. Inc., Bridgeport, Conn.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Erie Malleable Iron Co., W. 12th & Cherry Sts., Erie, Pa.
Jamestown Malleable Iron Corp., 500-700 Tiffany Ave., Jamestown, N. Y.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Peoria Malleable Castings Co., Peoria, Ill.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.

CASTINGS (Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Strong Steel Fdy. Co., Hertel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.

CASTINGS (Wear Resisting)
Meehanite Metal Corp., Pittsburgh, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.

CEMENT (Acid Proof)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CEMENT (High Temperature)
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.

CEMENT (Refractory, High Temperature)
Johns-Manville Corp., 22 E. 40th St., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

CHAIN (Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

CHAINS (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Peoria Malleable Castings Co., Peoria, Ill.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

CHAIN (Welded or Weldless)
American Chain & Cable Co., Bridgeport, Conn.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Lake Erie Engineering Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

CHECKER BRICK
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

CHUCKS (Automatic Closing)
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CLEANING SPECIALTIES
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CLUTCHES (Friction)
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Twin Disc Clutch Co., 1328 Racine Ave., Racine, Wis.

CLUTCHES (Friction, Overrunning Single Revolution)
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Koppers Co., The, Gas & Coke Div., Pittsburgh, Pa.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Coal Co., Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

» » » WHERE-TO-BUY « « «

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Koppers-Rheolaveur Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill .

COILS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COKE SCREENING PLANTS
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Gas Furnace Co., Elizabeth, N. J.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Compressor Corp., Harrison, N. J.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Combustion)—See COMBUSTION CONTROLS

CONTROLLERS (Electric)
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Oven)
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.

CONTROLS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYORS (Apron)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

COPPERING COMPOUND
American Chemical Paint Co., Ambler, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

COUPLERS (Hose, Instantaneous—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLERS (Valving, Safety—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, O.
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES (Creeper, Erection)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Hand)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa

CRANES (Jib)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Monorail)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Shepard Niles Crane & Hoist Corp. Montour Falls, N. Y.

CRANES (Traveling)
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Co., Massillon. O.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CRUSHERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CRUSHERS (Ring)
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.

CUTTERS (Die Sinking & End Milling)
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CYLINDERS (Air or Hydraulic)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co. Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DIE BLOCKS
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

DIE CASTINGS
Titan Metal Mfg. Co., Bellefonte, Pa.

WHERE-TO-BUY

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

DIES (Cast)
Advance Foundry Co., The, 100 Parnell Ave., Dayton, O.
Farrel-Birmingham Co., Inc., 110 Maine St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 818 Field Ave., Columbus, O.

DOORS FOR COKE OVENS (Automatic Self Sealing)
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Multiple, Heavy Duty)
Baker Bros. Co., Post & Westlake Sts., Toledo, O.
Moline Tool Co., Moline, Ill.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLING MACHINES (Radial)
Cincinnati Bickford Tool Co., Oakley Sta., Cincinnati, O.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Steel)
Pressed Steel Tank Co., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

DUST ARRESTING EQUIPMENT
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

ENGINEERS (Consulting)
Aetna-Standard Engineering Co., The, Youngstown, O.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Lindemuth, Lewis, B., 134 E. 47th St., New York City.
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINEERS, CONSULTING (By-Products Coke Oven & Gas Plants)
Koppers Co. Engineering and Construction Div., Pittsburgh, Pa.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

FACING MACHINES (Structural)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

FANS (Crane Cab)
Truflo Fan Co., Harmony, Pa.

FANS (Exhaust, Ventilating)
Sturtevant, B. F., Co. Hyde Park, Boston, Mass.
Truflo Fan Co., Harmony, Pa.

FANS (Portable)
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Truflo Fan Co., Harmony, Pa.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

FANS (Wall)
Truflo Fan Co., Harmony, Pa.

FENCE (Chain Link)
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Cyclone Fence Co., Waukegan, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

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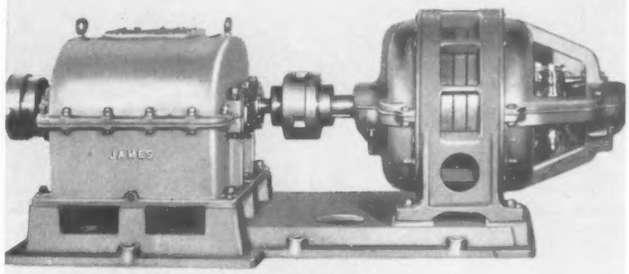

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FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Electro-Metallurgical Sales Corp., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON (Aluminum)
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROTITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
Electro Metallurgical Sales Corp. 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FILES AND RASPS
Simonds Saw & Steel Co., Fitchburg, Mass.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FIRE EXTINGUISHERS
Kidde, Walter, & Co., 140 Cedar St., New York City.

FIRESTONE (Silica)
National Stone Co., Ellwood City, Pa.

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FLAME HARDENING
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Forged Steel)
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.

FLANGES (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

FLOORING (Monolithic)
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Hillside Fluor Spar Mines, 38 So. Dearborn St., Chicago, Ill.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Ambler, Pa.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

FORGINGS (Drop) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.

FORGINGS (Hollow Bored)
Atlas Drop Forge Co., Lansing, Mich.
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

FORGINGS (Iron and Steel) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
*Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

FORGINGS (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.

FURNACES (Brazing)
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Gas or Oil)
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Greenfield, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Industrial)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Laboratory)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.

FURNACES (Open Hearth)
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 134 E. 47th St., New York City.

FURNACES (Recuperative)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Rivet Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)
Aetna-Standard Engineering Co., The, Youngstown, O.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Steel Mill)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNITURE (Tubular Steel)
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

GAGES
Greenfield Tap & Die Corp., Greenfield, Mass.

GALVANIZING (Hot Dip)
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Asso., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Chain Products Co., The, Cleveland, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.

GALVANIZING (Hot Dip)—Con.
Thomas Gregory Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GAS (Detarring)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS HOLDERS
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

GAS PRODUCERS PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

GAS RECOVERY COKE OVEN AND GAS PLANTS
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

GAS SCRUBBERS
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GASKETS (Asbestos, Metal or Rubber)
American Hard Rubber Co., 11 Mercer St., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City.

GAGES (Draft)
Peabody Engineering Corp., 580 Fifth Ave., New York City.

GAUGES (Indicating and Recording)
General Electric Co., Schenectady, N. Y.

GEAR BLANKS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

GEAR MACHINERY (Lapping, Finishing, Checking)
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

GEARS (Non-Metallic)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GEARS (Spur, Bevel, Miter)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS (Steel Laminated)
Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, O.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., 2501 Liberty Ave., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.

GENERATORS (Acetylene—Portable and Stationary)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 122 W. 22nd St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-9.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GRABS — FOR SHEETS, COILS, INGOTS
J-B Engineering Sales Co., New Haven, Conn.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

GREASE (Lubricating—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill

GRINDERS (Pedestal, High Speed)
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles Cal.

GRINDERS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

GRINDERS (Precision Thread)
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Heald Machine Co., Worcester, Mass.

GRINDING COMPOUNDS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Crank Pin, Cam, Piston, Valve Face)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Co., Waynesboro, Pa
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Landis Tool Co., Waynesboro, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rotary Surface)
Blanchard Machine Co., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Swing Frame)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

GRINDING MACHINES (Tool and Cutter)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING WHEELS
Abrasive Co., Taconey & Fraley Sts., Philadelphia, Pa.
Blanchard Machine Co., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

GRINDING WHEELS (Segment)
Blanchard Machine Co., Cambridge, Mass.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
National-Erie Corp., Erie, Pa.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

HACK SAWS
Simonds Saw & Steel Co., Fitchburg, Mass.

HAMMER BOARDS
Irwin, H. G. Lumber Co., 822 E. 8th St., Erie, Pa.

HAMMERS (Chipping, Riveting, Caiking)
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HANGERS
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HARDENING—See Case HARDENING

HARDWARE SPECIALTIES
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Peoria Malleable Castings Co., Peoria, Ill.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

HEATERS (Air)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.

Heaters (Oven)
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.

HEATERS (Unit)
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

HITCHINGS (Mine Car)
American Chain & Cable Co., Bridgeport, Conn.

HOBBING MACHINES
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOBS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

HOISTS (Chain)
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Ingersoll-Rand Co., 11 Broadway, New York City.

HOOKS (Chain)
American Chain & Cable Co., Bridgeport, Conn.

HOOPS AND BANDS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell St., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

HOSE (Flexible Metallic)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

HOSE (Rubber)
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

HYDRAULIC MACHINERY
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lake Erie Engineering Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

INDICATORS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

INDICATORS (Blast Furnace Stock Line)
Broslus, Edgar E., Inc., Sharpsburg, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Co., Hubbard, O.

INGOT PIPE ELIMINATORS
Alpha-Lux Co., 192 Front St., New York City.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INJECTORS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

INSULATING BLOCK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING BRICK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Products Co., Lancaster, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

JETS (Steam, for Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KEYS (Machine)
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYS (Woodruff)
Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES (Rotary)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

KNIVES (Shear, Solid Steel, Flying)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.

LABORATORY WARE
Norton Company, Worcester, Mass.

LACQUERS
Sipe, James B., & Co., Inc., So. Hills Branch, Pittsburgh, Pa.

LADDERS (Aluminum)
Aluminum Ladder Co., 216 Adams St., Tarentum, Pa.

LADLES
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

LAMPS (Filaments)
General Electric Co., Nela Park, Cleveland, O.

LAMPS (Mercury Vapor)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LAMPS (Neon Glow)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LAPPING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

LATHES
LeBlond, R. K., Machine Tool Co., 269 Madison Rd., Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.

LATHES (Automatic)
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)
Bullard Company, The, Bridgeport, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret) (Automatic Vertical)
Bullard Company, The, Bridgeport, Conn.

LEAD (Chemical, Corroding, Desilvered)
St. Joseph Lead Co., 250 Park Ave., New York City.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LEAD WORK
Dietzel Lead Burning Co., Coraopolis, Pa.

LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIGHT OIL RECOVERY & TREATMENT EQUIPMENT
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LININGS—for Soaking Pits and Ladles
National Stone Co., Ellwood City, Pa.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Gasoline Mechanical)
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS
Farval Corp., 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

MACHINERY (Second Hand)
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., The, Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Broslus, Edgar E., Inc., Sharpsburg, Pa.

WHERE-TO-BUY

MACHINERY (Special)
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Moline Tool Co., Moline, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co. First National Bank Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

MANGANESE ORE
Samuel, Frank, Co., Inc., Harrison Bldg., Philadelphia, Pa.

MANIPULATORS
Alliance Machine Co., The, Alliance, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind
Morgan Engineering Co., The, Alliance, O.

MARKERS (Industrial)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

MARKING DEVICES
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-9.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS (*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

NUTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2935 E. 79th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Stove & Range Co., 2039 Fulton Rd., Cleveland, O.

THE "ROCKFORD" LINE
AND
THE "HOLE HOG" LINE

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NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Cold Punched)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Hot Pressed)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Parker-Kalon Corp., 200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (Cutting)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Drawing)
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Paint)
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OILS (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

OVENS (Core and Mold)
Maehler, Paul, & Co., The, 2210 W. Lake St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill

PACKING (Asbestos or Rubber)
Goodyear Tire & Rubber Co., Akron, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1790 Broadway, New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Industrial)
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Marking)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Pretreatment)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.
Koppers Co., Tar & Chemical Div Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Stick Form)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

PERFORATED METAL
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co. 5634 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

PICKLING COMPOUND
American Chemical Paint Co., Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING EQUIPMENT
International Nickel Co., Inc., The, 67 Wall St., New York City.

PICKLING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
American Hard Rubber Co., 11 Mercer St., New York City.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

PILING (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Co., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper—Rubber or Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (New and Used)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE ELIMINATORS
Alpha-Lux Co., Inc., 192 Front St., New York City.

PIPE FITTINGS
American Hard Rubber Co., 11 Mercer St., New York City.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.

PIPE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE STRAIGHTENING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Lewman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

PIPING CONTRACTORS
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PISTON RINGS
American Hammered Piston Ring Div., The Koppers Co., Baltimore, Md.

PISTON RODS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATES (Sheared or Universal) (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PLUGS (Rubber)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.

POLISHING MACHINES, AUTOMATIC (Stainless Steel)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

POTS (Case Hardening)
Pressed Steel Tank Co., Milwaukee, Wis.

POTS (Melting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

POWER UNITS (Gasoline, Electric for Industrial Trucks)
Ready Power Co., 3818 Grand River Ave., Detroit, Mich.

PRECIPITATORS (Cottrell Electric)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

PREHEATERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

PRESSES (Forging)
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Lake Erie Engineering Corp., Kenmore Sta., Buffalo, N. Y.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.

PRESSES (Riveting)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULVERIZERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.

PUMPS (Boiler Feed)
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Hydraulic)
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Rotary)
Roper, Geo. D., Co., Rockford, Ill.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.

PUMPS (Vacuum)
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Norton Company, Worcester, Mass.

PYROMETERS
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

RAMS
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

REAMERS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Blanchard Machine Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REAMERS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REAMERS (Sand, Ingot Mold—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REBUILT EQUIPMENT
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa

RECEIVERS
Pressed Steel Tank Co., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Eureka Fire Brick Co., 1100 B. F Jones Law Bldg., Pittsburgh, Pa.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.

REFRACTORIES (For High Frequency Furnaces)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Carborundum Co., The, Perth Amboy, N. J.

REFRACTORIES (High Temperature)
Alpha-Lux Co., Inc., 192 Front St., New York City.

REFRACTORIES (Silica)
Alpha-Lux Co., Inc., 192 Front St., New York City.

REFRACTORIES (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

REGULATORS (Temperature)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1326 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

RINGS (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RINGS (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RIVETERS (Hydraulic—Portable and Stationary)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETERS (Jam, Pedestal, Staybolt, Squeeze, Stationary, Yoke—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

RIVETERS (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY
Chambersburg Engineering Co., Chambersburg, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

RIVETS (*Also Stainless)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Kidd Drawn Steel Co., Aliquippa, Pa.

RODS (Piston)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. St., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Titan Metal Mfg. Co., Bellefonte, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL COOLERS (Internal, Water)
Hunt, C. B., & Son, Salem, O.

ROLL FORMING MACHINES
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

ROLLER LEVELERS (Backed-up)
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

ROLLERS (Rubber)
Goodyear Tire & Rubber Co., Akron, O.

ROLLING DOORS & SHUTTERS—SEE DOORS & SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Aetna Standard Engineering Co., The, Youngstown, O.
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ROLLS (Bending and Straightening)
Lake Erie Engineering Co., Kenmore Sta., Buffalo, N. Y.

ROLLS (Sand and Chilled)
Aetna-Standard Engineering Co., The, Youngstown, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING (Plastic and Liquid)
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Goodyear Tire & Rubber Co., Akron, O.
Rhoades, R. W., Metaline Co., 50 3rd St., Long Island City, N. Y.
United States Rubber Co., 1790 Broadway, New York City.

RUBBER PLUGS—See PLUGS

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

RUST PROOFING PROCESS
American Chemical Paint Co., Ambler, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 208 W. Washington St., Chicago, Ill.

SAND CONDITIONING AND PREPARING MACHINERY
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAWS (Hot and Cold)
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SAWS (Inserted Tooth, Cold)
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Simonds Saw & Steel Co., Fitchburg, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

SCAFFOLDING (Tubular)
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

SCALES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Monorail)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Kron Co., The, Bridgeport, Conn.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

SCALING TOOLS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES
Chicago Perforating Co., 2443 W. 24th Pl. Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.
Progressive Mfg. Co., Torrington, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Progressive Mfg. Co., Torrington, Conn.

SCREWS (Cap, Set, Safety-Set)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.

SCREWS (Cold Headed)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Hardened Self-Tapping)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Machine)
Progressive Mfg. Co., Torrington, Conn.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Parker-Kalon Corp., New York City.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Parker-Kalon Corp., New York City.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Socket, Head, Cap)
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.

SCREWS (Thumb)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Pheoll Mfg. Co., Chicago, Ill.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAFTS (Clutch)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

SHAPES (Brass, Bronze, Nickel Silver)
Titan Metal Mfg. Co., Bellefonte, Pa.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.

SHEARS
Aetna-Standard Engineering Co., The, Youngstown, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hallden Machine Co., The, Thomaston, Conn.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEET BARS
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEET LIFTERS AND CARRIERS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.
Niagara Machine & Tool Works 637 Northland Ave., Buffalo, N. Y.

SHEET STEEL ASSEMBLIES (Fabricated)
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.

SHEET STEEL PILING (New and Used)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)
International Nickel Co., Inc., The, 67 Wall St., New York City.

SHEETS (Black)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Deep Drawing and Stamping)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Electrical)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Galvanized)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Long Terne)
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SIEVES—See SCREENS AND SIEVES

SILICO-MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.

SKELP (Steel)—Con.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.

SOAKING PITS
Amsler-Morton Co., Fulton Bldg., Pittsburgh, Pa.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLVENT (Degreasing)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co. 3249 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

SPINDLES (Lathe)
American Hollow Boring Co., 1054 W. 20th St., Erie, Pa.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Coil and Elliptic)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Oil Tempered—Flat)
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.

SPROCKETS
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

SPRUE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Pressed Steel Tank Co., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Stanley Works, The, New Britain, Conn.
Toledo Stamping & Mfg. Co., 99 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1661 W. Lafayette Blvd., Detroit, Mich.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Henpenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Mfg. Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Granite City Steel Co., Granite City, Ill.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Steel & Tube Co., Canton, O.

STEEL (Die)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.

STEEL (Drill)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.

STEEL (Electric)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Steel & Tube Co., Canton, O.

STEEL (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

WHERE-TO-BUY

STEEL (Strip, Copper Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Stanley Works, The, New Britain, Conn, Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co. Brown Marx Bldg., Birmingham, Ala.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Weirton Steel Co., Weirton, W. Va
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Strip, Tin Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., The, Warren, O
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural) (*Also Stainless)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Kidd Drawn Steel Co., Aliquippa, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

STOPPERS (Cinder Notch)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa
Brosius, Edgar E., Inc., Sharpsburg, Pa.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3438 E. 76th St., Cleveland, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2892 W. Liberty Ave., Pittsburgh, Pa.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

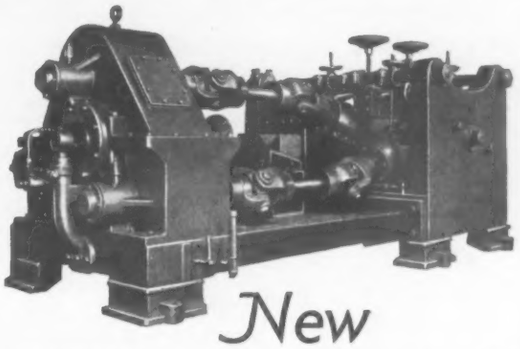
SWAGING MACHINES
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

SWITCHES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

TACHOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANKS (Pickling)
American Hard Rubber Co., 11 Mercer St., New York City.
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

TANKS (Quenching, Automatic)
American Gas Furnace Co., Elizabeth, N. J.



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Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

TANKS—WOOD OR STEEL (Rubber or Lead Lined)
American Hard Rubber Co., 11 Mercer St., New York City.
Dietzel Lead Burning Co., Coraopolis, Pa.
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

TERNE PLATE—See TIN PLATE

TESTING MACHINES (Moisture Tester)
Alpha-Lux Co., Inc., 192 Front St., New York City.

THERMOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Inc., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Tipped, Carbide)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

TORCHES AND BURNERS (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRANSFORMERS
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

TRANSMISSIONS VARIABLE SPEED
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

TRAPS (Steam and Radiator)
Johns-Manville Corp., 22 E. 40th St., New York City.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Ford Chain Block Div. American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Lift)
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.

TUBE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.

TUBE WELDING MACHINES
Etna Machine Co., The, 3400 Maplewood Ave., Toledo, O.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.

TUBING (Alloy Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Timken Steel & Tube Co., Canton, O.

TUBING (Cold Drawn Seamless Steel)
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.

TUBING (Copper, Brass, Aluminum)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Shenango-Penn Mold Co., Dover, O.

TUBING (Phosphor Bronze)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Seamless Flexible Metal)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Welded Steel)
Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

TUNGSTEN CARBIDE
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TUNGSTEN CARBIDE (Tools and Dies)
Firth-Sterling Steel Co., McKeesport, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TURBINES (Steam)
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General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

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Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

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Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

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Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

VALVES (Gate)
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgepart, Conn.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

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VALVES AND FITTINGS—See PIPE FITTINGS

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Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

VISES (Bench)
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

WALKWAYS—See FLOORING—STEEL

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Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Peoria Malleable Castings Co., Peoria, Ill.

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Lincoln Electric Co., The, Cleveland, O., Dept. 20-9.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-9.
Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

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Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.

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Lincoln Electric Co., The, Cleveland, O., Dept. 20-9.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
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Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Alloys)
American Agile Corp., 5806 Hough Ave., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-9.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING RODS (Bronze)
Titan Metal Mfg. Co., Bellefonte, Pa.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

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American Brass Co., The, 25 Broadway, New York City.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-9.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Washburn Wire Co., Phillipsdale, R. I.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

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National-Erie Corp., Erie, Pa.

WINCHES (Electric)
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*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
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Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
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Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)
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Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Brass)
Titan Metal Mfg. Co., Bellefonte, Pa.

WIRE (Cold Drawn)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (High Carbon)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Washburn Wire Co., 118th St. and Harlem River, New York City.

WIRE (Music)
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Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

WIRE (Round, Flat, Square, Special Shapes)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., Los Angeles, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee, Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. & Harlem River, New York City.

WIRE (Stainless)
Firth-Sterling Steel Co., McKeesport, Pa.
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.

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Cyclone Fence Co., Waukegan, Ill.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

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Lewis Machine Co., 3438 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Searles Electric Welding Works, 1850 W. Fulton St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., 118th St. and Harlem River, New York City.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE ROPE AND FITTINGS (*Also Stainless)
American Cable Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Hazard Wire Rope Div. of American Chain & Cable Co. Inc., Wilkes-Barre, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
Page Steel & Wire Co., Monessen, Pa.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
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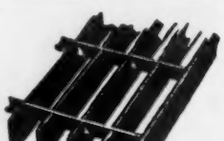

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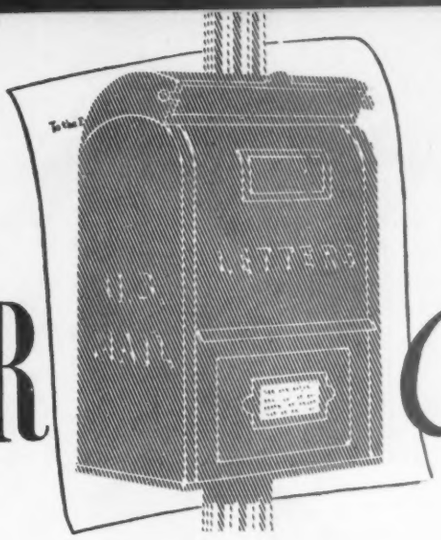
READER  Comments

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Regaining Ocean Prestige

To the Editor:

At the rate shipping of European nations is being destroyed by war activities, which seems likely to continue for some time, the present building activities of the United States maritime commission in adding to our merchant marine seems most timely, though undertaken before the war started.

At the close of hostilities, whether soon or late, demand for ocean bottoms to carry world trade will be strengthened and with added vessels of American register to take the place of those lost in the war this country will regain much of its former prestige on the seas.

In view of present circumstances the work of the commission has been most timely and promises to be of great value. Inquiries for bids on more than the year's quota (STEEL, Sept. 18, p. 25) doubtless resulted from opening of hostilities but the addition of 50 ships per year for ten years, the original plan, would do much to improve our situation.

EXPORTER

New York

Steel Field Limitless

To the Editor:

In reading STEEL recently I have been struck forcibly by the fact that steel, the metal, has broadened its field and entered so many byways where formerly other materials were supreme. Probably it is not surprising that sheets and strip have replaced wood, since they are so cheap and lasting, as well as being sanitary and capable of artistic treatment.

One instance is the action of the government in purchasing nearly 40,000 steel corn cribs for storage of corn. When I was a young man on the farm corn cribs were universally of wood and no one ever gave a thought to any other material. Yet here in two contracts nearly 40,000 tons of steel will be used in a relatively new outlet.

Then, in a later issue of STEEL I read that a housing project in New York will have more than 12,000 steel kitchen cabinets, using about 4000 tons of sheet steel. Clean, vermin-proof and sightly, these will add to the comfort of living.

These are only highlights indicating the steadily enlarging adaptation of steel to new uses, which has been gaining strength for the past few years. Probably the multiple uses of which these are representative make up a large portion of the demand for steel which your market reporters denominate "miscellaneous," since they cannot be classified as can automotive, railroad, shipbuilding and other mass buyers.

In the constant battle between materials, steel against wood, aluminum, copper and zinc against steel and plastics against all of these, steel has held its position remarkably and has made consistent gains. Much of this, to my mind, has resulted from the agility of steelmakers in producing what you have called "tailormade" steels, fitted to new uses and serving better than the materials to which we long have been accustomed.

It is a matter of speculation where this tendency will end, if at all.

JOHN THOMAS

Pittsburgh

Depreciation and Dividends

To the Editor:

Industry continually has been allowed by the government to charge off a certain percentage of the value of physical assets into the profit and loss account as depreciation. The charge of depreciation to the profit and loss account has been offset by setting up a reserve for depreciation.

The purpose of setting up this reserve has been to protect the investor's investment, from the standpoint of having the money on hand to turn over the original investment by replacing depreciated equipment with new, modern equipment.

In the past it has been the practice with some industries to transfer this reserve money into the earned surplus account and pay dividends with the reserve money.

The stockholder receives a "dividend" check, but does not realize the check is actually paying back part of his original investment, and is not a check for profit on his investment.

The dividend the stockholder receives has to be included in his gross income, on the assumption that it is his share of the earnings from his investment. In reality the check is wholly or partly a liquidating dividend.

We hear so much that industry today needs equipment, and has no money with which to make the purchase. The investor may rightfully ask what happened to the reserve fund money? Was it paid out as dividends? This is something for management to think about.

ACCOUNTANT

Lakewood, Ohio.

Tech

STATEMENT OF POLICY

The world is entering a crisis, the result of which no one can foresee. Other wars have brought inflation, followed by unemployment and depression after peace was achieved. America's experience in the World War illustrates this fact.

Much of this post-war trouble would have been eliminated by a more foresighted price policy on the part of manufacturers and distributors. Price inflation by the seller when he had a dominant position resulted inevitably in reaction with deflation, depression and suffering. Many of those price increases were not warranted.

Before such an inflationary cycle of prices is again started, we publicly pledge ourselves, as far as possible, to maintain present prices.

Further, if the materials we buy are increased in price, or the cost of labor is increased, then we pledge ourselves to raise selling prices no more than the bare increase in cost of raw materials and labor going into our products.

Further, we pledge ourselves to pass on to our customers the reduction in cost made possible by better manufacturing methods, wider distribution and technical advances in production.

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